Non-responsive



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION5 77 WEST JACKSON BOULEVARD CHICAGO, IL 60604-3590

APR 2 0 2005

REPLY TO THE ATTENTION OF

Judith Gorog, Chief Financial Officer Ugitech S.A. Avenue Paul Girod 73403 Ugine France

Re:

Techalloy Company, Inc.

Financial Assurance for Corrective Measures Implementation

Dear Ms. Gorog:

In response to a request from your attorney, the U.S. EPA is providing you with this letter regarding the financial assurance which Ugitech S.A. has been providing for implementation of RCRA corrective action being performed at the Techalloy Company, Inc., facility in Union, Illinois. This RCRA corrective action is being performed by Techalloy Company pursuant to an Administrative Order on Consent, EPA Docket No. R8H-5-99-008, (AOC). Section XXII of the AOC requires that Techalloy Company provide \$3 million in financial assurance.

To date, the \$3 million financial assurance has been provided by Ugitech S.A., and its corporate predecessor Ugine Savoie Imphy, through a corporate guarantee. That corporate guarantee was originally established on August 28, 2000, by Ugine Savoie Imphy. Through your attorney, you have informed us that on February 8, 2005, 100% of the stock of Techalloy Company, Inc., was sold by Ugitech S.A. to Central Wire Industries, Ltd., a Canadian company, and that Techalloy Company and its new corporate parent are required by the stock purchase agreement to establish an alternate form of financial assurance under the AOC.

In connection with your request that the U.S. EPA provide you with this letter, we note that in a November 23, 2004, letter the U.S. EPA approved a reduction in the amount of financial assurance required for the Techalloy Company facility, to \$561,000. We also note that Techalloy Company has established an irrevocable standby letter of credit to provide this reduced financial assurance, effective February 8, 2005. While Section XXII of the AOC has not yet been modified to reflect this reduction in the amount of financial assurance, we do not consider that an obstacle to providing you with this letter.

Therefore, based on the information mentioned above, the U.S. EPA hereby releases Ugitech S.A. from any future obligation under the AOC to provide financial assurance for the Techalloy Company facility in Union, Illinois.

Sincerely,

Margare M. Guerriero, Director

Waste, Pesticides and Toxics Division

Region 5, U.S. EPA

cc: Margaret Rosegay, Pillsbury Winthrop (by fax and mail)

OFFICE OF REGIONAL COUNSEL CONCURRENCE SHEET

SUBJECT: Letter	- Regarding CM	Inim, Illinois
Techall	on "Company, L	Inim, Flynois
CONTROL NO. (if applicab	ile):	
Originator and first level s	upervisor are responsi	ble for assuring that documents are in plain
0 0	-	lain language in their reviews. See plain
language checklist on reve	rse side of this sheet.	
Originator	(J, Miller) Mm Date 4/13/05
Section Chief)Date
Branch Chief	(Nelson/Cohen)Date
Deputy RC	(Frey)Date
Regional Counsel	(Frey (Acting))Date
COMMENTS:		
(PLEASE INDICATE NA SIGNOFF IS NECESSAR		TE DIVISION(S) WHERE CONCURREN
NAME OF DIVISION	WPTD	
Assigned Staff Person	(B. Sundar (G. Hamper (c. Phillips	B; Sund & Date 4/14/05
Other	(G. Hamper	1 House Date 4:14-05
Other	(Phillips	E1 Hallyn Date 4/18/05
Division Director	(Guerriero) RP1 Date 4/19/05
OFFICE OF THE REGIO	NAL ADMINISTRAT	OR
Other	()Date
Other	()Date
Deputy Regional Administrator	(Mathur)Date
Regional Administrator	(Skinner)Date
COMMENTS:		

RETURN TO ORC-Cheryl Klebenow (886-6771)(C-14J) 11/04/03 Version



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5 77 WEST JACKSON BOULEVARD CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

December 6, 2005

David Novitski Thelen Reid & Priest LLP 333 South Hope Street, Suite 2900 Los Angeles, California 90071-3048

> Re: Techalloy Company facility in Union, Illinois; Modification to EPA Consent Order

Dear Dave:

Attached is one fully-executed copy of the Modification to Administrative Order on Consent between the U.S. EPA and Techalloy, U.S. EPA Docket No. R8H-5-99-008.

Techalloy now should proceed with signing the Standby Trust Agreement with Wells Fargo Bank. We already have agreed as to the form of that Standby Trust Agreement (a copy was sent to you with my October 19th letter). The Modification requires that Techalloy enter into a standby trust agreement within 30 days of the effective date of the Modification. As the effective date of the Modification is November 29, 2005, which is the date that the U.S. EPA signed it, Techalloy must enter into a standby trust agreement no later than December 29, 2005.

Please mail me an original, signed, copy of the fully-executed Standby Trust Agreement.

There are two related items to mention. First, although the Standby Trust Agreement allows the Trustee to deduct its expenses from the trust fund, and allows for taxes to be paid from the trust fund, because the letter of credit was established in the amount of \$561,000 without including such expense the U.S. EPA expects that Techalloy will pay all such expenses and taxes from its own funds. Second, the financial assurance for RCRA closure regulations -- which we are applying to corrective action financial assurance -- provide that a facility owner/operator annually reassess the cost estimate for inflation within 60 days prior to the anniversary date of the relevant financial instrument (40 CFR 265.142(b)). It is appropriate for Techalloy to do the same here, with respect to the cost estimate for the remaining corrective action work. Please let me know if this poses any problem.

Finally, in the past I have asked for copies of relevant documents as to Central Wire's acquisition of Techalloy. Could you send those to me now?

If you or your client have any questions, please telephone me at 312/886-7167, or e-mail me at miller.jacqueline@epa.gov.

Sincerely,

Jacqueline Miller

Associate Regional Counsel

Enclosures

cc: B. Sundar, EPA (w/o enclosures)



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5 77 WEST JACKSON BOULEVARD CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

October 5, 2005

Jack Thorsen
Matrix Environmental
1880 W. Winchester Rd.
Suite 111
Libertyville, Illinois 60048

Re: Techalloy Company facility in Union, Illinois

Dear Mr. Thorsen:

At your request I am enclosing copies of materials concerning all modifications to the Administrative Order on Consent, No. R8H-5-99-008, entered into by Techalloy Company, Inc., and U.S. EPA since the date the Order was signed and became effective on September 30, 1999. The letters dated September 27, 2004, and November 23, 2004, concern Techalloy Company's request for a reduction in financial assurance for the work, from the \$3 million referenced in the Order to \$561,000. The U.S. EPA approved that request in our November 23, 2004, letter. I have been working with Techalloy Company's attorney to develop a modification to the Order recognizing this reduced financial assurance; I expect that modification will be executed within a month.

If you have any further questions, you may telephone me at 312/886-7167, or the U.S. EPA technical assignee for this matter, Bhooma Sundar, whose telephone number is 312/886-1660.

Sincerely,

Jacqueline Miller

Associate Regional Counsel

Enclosures

cc: Bhooma Sundar (w/o enclosures)

STANDBY TRUST AGREEMENT

GRANTOR	TRUSTEE
Owner/Operator Name Techalloy Company, Inc.	Trustee Name Wells Fargo Bank, N.A.
Address 6509 Olson Road Union, Illinois 60180	Address
A Pennsylvania corporation	A National Bank

This Standby Trust Agreement, the "Agreement", is entered into as of October ____, 2005 by and between Techalloy Company, Inc., a Pennsylvania corporation, the "Grantor," and Wells Fargo Bank, N.A., a national bank, the "Trustee".

Whereas, the United States Environmental Protection Agency, "EPA," an agency of the United States Government, and the Grantor entered into an Administrative Order on Consent ("the Order"), EPA Docket No. R8H-5-99-008, with an effective date of September 30, 1999, (a copy of which is Attachment 1) which required that the Grantor implement certain corrective measures at the Techalloy Company, Inc., facility located in Union, Illinois,

Whereas, effective _____, 2005, the EPA and the Grantor mutually agreed to a Modification of Administrative Order on Consent ("the Modification", a copy of which is Attachment 2), which modified Section XII, Financial Responsibility, of the Order,

Whereas, the Modification provides, at amended Paragraph XII.A, that the Grantor is providing financial assurance in the amount of five-hundred and sixty-one thousand dollars (\$561,000.00) for the future costs of implementing, operating, and maintaining the corrective measures selected in the Order,

Whereas, the Grantor has elected to secure an irrevocable standby letter of credit to provide all of such financial assurance for the future implementation of the corrective measures selected in the Order,

Whereas, the irrevocable standby letter of credit obtained by the Grantor was issued by the Bank of Nova Scotia on February 8, 2005, is in the amount of five-hundred and sixty-one thousand dollars (\$561,000.00), provides that it shall expire on February 7, 2006, but may be automatically extended for a period of one year, provides that the EPA may draw upon it under certain conditions, and bears No. S40006/219856,

Whereas, the Grantor also has elected to establish this Standby Trust Agreement, which will be funded by the irrevocable standby letter of credit, No. S40006/219856, if the EPA draws upon the letter of credit,

Whereas, the Grantor, acting through its duly authorized officers, has selected the Trustee to be the trustee under this agreement, and the Trustee is willing to act as trustee,

Now, Therefore, the Grantor and the Trustee agree as follows:

Section 1. <u>Definitions</u>. As used in this Agreement:

- (a) The term "Grantor" means the Techalloy Company, Inc., which is the owner and operator of the Techalloy Company facility located in Union, Illinois, who enters into this Agreement, and any successors or assigns of the Grantor.
- (b) The term "Trustee" means the Trustee who enters into this Agreement and any successor Trustee.
- Section 2. <u>Identification of Facilities and Cost Estimates</u>. This Agreement pertains to the facility and cost estimate identified on attached Schedule A.
- Section 3.1. <u>Standby Trust</u>. This Trust shall remain dormant until funded with the proceeds from the irrevocable standby letter of credit identified above. During the dormancy of this Trust, the Trustee shall have no duties or responsibilities beyond the safekeeping of this Agreement. Upon funding, this Trust shall become active and be administered pursuant to the terms of this Agreement.
- Section 3.2. Establishment of Fund. The Grantor and the Trustee hereby establish a trust fund, the "Fund," for the benefit of EPA. The Grantor and the Trustee intend that no third party have access to the Fund except as herein provided. The Fund is established initially as consisting of the property, which is acceptable to the Trustee, described in Schedule B attached hereto. Such property and any other property subsequently transferred to the Trustee is referred to as the Fund, together with all earnings and profits thereon, less any payments or distributions made by the Trustee pursuant to this Agreement. The Fund shall be held by the Trustee, IN TRUST, as hereinafter provided. The Trustee shall not be responsible nor shall it undertake any responsibility for the amount or adequacy of, nor any duty to collect from the Grantor, any payments necessary to discharge any liabilities of the Grantor established by EPA.
- Section 4. Payment for Corrective Measures. The Trustee shall make payments from the Fund as the EPA Regional Administrator of Region 5 shall direct, in writing, to provide for the payment of the costs of future implementation of corrective measures at the facility covered by this Agreement, as required by the Order and any modifications of the Order; such costs may include, but are not limited to, the operation and maintenance costs of installed and constructed elements of the corrective measures. The Trustee shall reimburse the Grantor or other persons as specified by the EPA Regional Administrator from the Fund in such amounts as the EPA Regional Administrator shall direct in writing. In addition, the Trustee shall refund to the Grantor such amounts as the EPA Regional Administrator specifies in writing. Upon refund, such funds shall no longer constitute part of the Fund as defined herein.
- **Section 5. Payments Comprising the Fund.** Payments made to the Trustee for the Fund, by the provider of financial assurance pursuant to the EPA Regional Administrator's instructions, shall consist of cash or securities acceptable to the Trustee.
- **Section 6.** <u>Trustee Management</u>. At such time as the corpus of the Trust is funded, the Trustee shall invest and reinvest the principal and income of the Fund and keep the Fund invested as a single fund, without distinction between principal and income, in accordance with general investment policies and guidelines which the Grantor may communicate in writing to the

Trustee from time to time, subject, however, to the provisions of this section. In investing, reinvesting, exchanging, selling, and managing the Fund, the Trustee shall discharge his duties with respect to the trust fund solely in the interest of the beneficiary and with the care, skill, prudence, and diligence under the circumstances then prevailing which persons of prudence, acting in a like capacity and familiar with such matters, would use in the conduct of an enterprise of a like character and with like aims; except that:

- (i) Securities or other obligations of the Grantor, or any other owner or operator of the facility, or any of their affiliates as defined in the Investment Company Act of 1940, as amended, 15 U.S.C. 80a-2.(a), shall not be acquired or held, unless they are securities or other obligations of the Federal or a State government;
- (ii) The Trustee is authorized to invest the Fund in time or demand deposits of the Trustee, to the extent insured by an agency of the Federal or State government; and
- (iii) The Trustee is authorized to hold cash awaiting investment or distribution uninvested for a reasonable time, but not to exceed thirty (30) days, without liability for the payment of interest thereon.

Section 7. Commingling and Investment. The Trustee is expressly authorized in its discretion:

- (a) To transfer from time to time any or all of the assets of the Fund to any common, commingled, or collective trust fund created by the Trustee in which the Fund is eligible to participate, subject to all of the provisions thereof, to be commingled with the assets of other trusts participating therein; and
- (b) To purchase shares in any investment company registered under the Investment Company Act of 1940, 15 U.S.C. 80a–1, et seq., including one which may be created, managed, underwritten, or to which investment advice is rendered or the shares of which are sold by the Trustee. The Trustee may vote such shares in its discretion.
- **Section 8.** Express Powers of Trustee. Without in any way limiting the powers and discretions conferred upon the Trustee by the other provisions of this Agreement or by law, the Trustee is expressly authorized and empowered:
 - (a) To sell, exchange, convey, transfer, or otherwise dispose of any property held by it, by public or private sale. No person dealing with the Trustee shall be bound to see to the application of the purchase money or to inquire into the validity or expediency of any such sale or other disposition;
 - (b) To make, execute, acknowledge, and deliver any and all documents of transfer and conveyance and any and all other instruments that may be necessary or appropriate to carry out the powers herein granted;
 - (c) To register any securities held in the Fund in its own name or in the name of a nominee and to hold any security in bearer form or in book entry, or to combine certificates representing such securities with certificates of the same issue held by the

Trustee in other fiduciary capacities, or to deposit or arrange for the deposit of such securities in a qualified central depositary even though, when so deposited, such securities may be merged and held in bulk in the name of the nominee of such depositary with other securities deposited therein by another person, or to deposit or arrange for the deposit of any securities issued by the United States Government, or any agency or instrumentality thereof, with a Federal Reserve bank, but the books and records of the Trustee shall at all times show that all such securities are part of the Fund;

- (d) To deposit any cash in the Fund in interest-bearing accounts maintained or savings certificates issued by the Trustee, in its separate corporate capacity, or in any other banking institution affiliated with the Trustee, to the extent insured by an agency of the Federal or State government; and
 - (e) To compromise or otherwise adjust all claims in favor of or against the Fund.
- Section 9. <u>Taxes and Expenses</u>. All taxes of any kind that may be assessed or levied against or in respect of the Fund and all brokerage commissions incurred by the Fund shall be paid from the Fund. All other expenses incurred by the Trustee in connection with the administration of this Trust, including fees for legal services rendered to the Trustee, the compensation of the Trustee to the extent not paid directly by the Grantor, and all other proper charges and disbursements of the Trustee shall be paid from the Fund.
- Section 10. <u>Annual Valuation</u>. The Trustee shall annually, at least 30 days prior to the anniversary date of establishment of the Fund, furnish to the Grantor and to the EPA Regional Administrator of Region 5 a statement confirming the value of the Trust. Any securities in the Fund shall be valued at market value as of no more than 60 days prior to the anniversary date of establishment of the Fund. The failure of the Grantor to object in writing to the Trustee within 90 days after the statement has been furnished to the Grantor and the EPA Regional Administrator shall constitute a conclusively binding assent by the Grantor, barring the Grantor from asserting any claim or liability against the Trustee with respect to matters disclosed in the statement.
- Section 11. <u>Advice of Counsel</u>. The Trustee may from time to time consult with counsel, who may be counsel to the Grantor, with respect to any question arising as to the construction of this Agreement or any action to be taken hereunder. The Trustee shall be fully protected, to the extent permitted by law, in acting upon the advice of counsel.
- Section 12. <u>Trustee Compensation</u>. The Trustee shall be entitled to reasonable compensation for its services as agreed upon in writing from time to time with the Grantor.
- Section 13. <u>Successor Trustee</u>. The Trustee may resign or the Grantor may replace the Trustee, but such resignation or replacement shall not be effective until the Grantor has appointed a successor trustee and this successor accepts the appointment. The successor trustee shall have the same powers and duties as those conferred upon the Trustee hereunder. Upon the successor trustee's acceptance of the appointment, the Trustee shall assign, transfer, and pay over to the successor trustee the funds and properties then constituting the Fund. If for any reason the Grantor cannot or does not act in the event of the resignation of the Trustee, the Trustee may

apply to a court of competent jurisdiction for the appointment of a successor trustee or for instructions. The successor trustee shall specify the date on which it assumes administration of the trust in a writing sent to the Grantor, the EPA Regional Administrator, and the present Trustee by certified mail 10 days before such change becomes effective. Any expenses incurred by the Trustee as a result of any of the acts contemplated by this Section shall be paid as provided in Section 9.

Section 14. Instructions to the Trustee. All orders, requests, and instructions by the Grantor to the Trustee shall be in writing, signed by such persons as are designated in the attached Exhibit A or such other designees as the Grantor may designate by amendment to Exhibit A. The Trustee shall be fully protected in acting without inquiry in accordance with the Grantor's orders, requests, and instructions. All orders, requests, and instructions by the EPA Regional Administrator to the Trustee shall be in writing, signed by the EPA Regional Administrator of Region 5, or his designee, and the Trustee shall act and shall be fully protected in acting in accordance with such orders, requests, and instructions. The Trustee shall have the right to assume, in the absence of written notice to the contrary, that no event constituting a change or a termination of the authority of any person to act on behalf of the Grantor or EPA hereunder has occurred. The Trustee shall have no duty to act in the absence of such orders, requests, and instructions from the Grantor and/or EPA, except as provided for herein.

Section 15. <u>Amendment of Agreement</u>. This Agreement may be amended by an instrument in writing executed by the Grantor, the Trustee, and the EPA Regional Administrator of Region 5, or by the Trustee and the EPA Regional Administrator of Region 5 if the Grantor ceases to exist.

Section 16. <u>Irrevocability and Termination</u>. Subject to the right of the parties to amend this Agreement as provided in Section 15, this Trust shall be irrevocable and shall continue until terminated at the written agreement of the Grantor, the Trustee, and the EPA Regional Administrator of Region 5, or by the Trustee and the EPA Regional Administrator of Region 5 if the Grantor ceases to exist. Upon termination of the Trust, all remaining trust property, less final trust administration expenses, shall be delivered to the Grantor.

Section 17. <u>Immunity and Indemnification</u>. The Trustee shall not incur personal liability of any nature in connection with any act or omission, made in good faith, in the administration of this Trust, or in carrying out any directions by the Grantor or the EPA Regional Administrator of Region 5 that are issued in accordance with this Agreement. The Trustee shall be indemnified and saved harmless by the Grantor or from the Trust Fund, or both, from and against any personal liability to which the Trustee may be subjected by reason of any act or conduct in its official capacity, including all expenses reasonably incurred in its defense in the event the Grantor fails to provide such defense.

Section 18. <u>Choice of Law.</u> This Agreement shall be administered, construed, and enforced according to the laws of the State of Illinois.

Section 19. <u>Interpretation</u>. As used in this Agreement, words in the singular include the plural and words in the plural include the singular. The descriptive headings for each Section of this Agreement shall not affect the interpretation or the legal efficacy of this Agreement.

IN WITNESS WHEREOF the parties have caused this Agreement to be executed by their respective officers duly authorized and their corporate seals to be hereunto affixed and attested as of the date first above written:

Signature of Grantor	Title President
Typed or Printed Name of Person Signing Lawrence L. Smith Attest: Title	Seal
Signature of Trustee	Title
Typed or Printed Name of Person Signing	Seal
Attest: Title	

SCHEDULE A

Facility:

Techalloy Company, Inc. 6509 Olson Road Union, Illinois 60180

EPA I.D. No.:

ILD 005 178 975

Corrective Measures Implementation Cost Estimate

Five Hundred Sixty-One Thousand Dollars (\$561,000.00) as of September 2004.

STANDBY TRUST AGREEMENT

SCHEDULE B

List of Property Comprising Trust Fund

Funding of this Standby Trust Agree	anent is
Errevocable Standby Letter of Credit Surety Bond or Letter of Credit	S40006/219856 Number
otia	
Issuing Institution	
	Surety Bond or Letter of Credit Otia Issuing Institution

Non-responsive



February 8, 2005

USEPA Region 5
Ms. Jacqueline Miller
Associate Regional Counsel
77 West Jackson Boulevard
Chicago, IL 60604-3590

Re: RCRA Section 3008(h) Administrative Order on Consent for Corrective Measures Implementation — Techalloy Company, Inc., ILD 005178975 — Substitution of Financial Mechanism

Dear Ms. Miller:

Regarding the referenced financial assurance, we would like to inform you that the stock of Techalloy Company, Inc. was recently sold pursuant a Purchase Agreement dated February 8, 2005. To date, Techalloy has provided financial assurances for corrective action at its Union, IL facility in the form of a corporate guarantee from Ugine-Savoie Imphy, Techalloy's former parent, in the amount of \$3 million (the amount specified in the Section 3008(h) Order). Due to Techalloy's completion of corrective measures implementation, EPA recently agreed that financial assurances may be reduced to \$561,000, consistent with future operation and maintenance costs. Please refer to the letter of November 23, 2004 from Ms. Bhooma Sundar to Scott Carr, Techalloy's Environmental Coordinator for the Union Facility.

In accordance with the Purchase Agreement, Techalloy agreed to substitute the existing corporate guarantee from Ugine-Savoie Imphy with an alternate financial mechanism acceptable to EPA. An irrevocable standby letter of credit, copy enclosed, has been selected for this purpose. The purchaser (Techalloy's new parent) is under certain contractual obligations to the seller (Techalloy's former parent) relating to the subject of financial assurances. Accordingly, we would appreciate your review and approval of this documentation at your earliest opportunity. The existing corporate guarantee from Ugine-Savoie Imphy will be terminated once we receive notice of EPA's approval of the letter of credit and the Consent Order is modified.

We also understand that it will be necessary to modify the Consent Order to reflect the EPAapproved reduction in the amount of financial assurance we are required to maintain. We will pursue this issue with you in separate correspondence in the near future.



Thank you for your cooperation in this regard. If you need additional information please feel free to contact me at (201) 529-0900 ext. 114. I look forward to hearing from you at your earliest convenience.

Sincerely,

Henry Lope's

Vice President Operations

copy: Margaret Rosegay, Pillsbury Winthrop

Bhooma Sundar, USEPA

David E. Novitski, Thelen Reid & Priest LLP



Matrix Environmental, Inc. 357 Milwaukee Ave. Suite A Libertyville, Illinois 60048 Phone: 847-367-6835 Fax: 847-367-6845

2 September 2004

Ms. Bhooma Sundar
U.S. Environmental Protection Agency
Region V
RCRA Enforcement and Compliance Assurance Branch (DE-9J)
77 West Jackson Boulevard
Chicago, Illinois 60604

Re: Techalloy Corrective Action Financial Assurance Cost Estimate

Union, Illinois Facility

Dear Ms. Sundar:

The Techalloy Company (Techalloy) requests that the U.S. Environmental Protection Agency (U.S. EPA) grant a revised Corrective Action Financial Assurance Cost Estimate for the Techalloy facility (ILD 005-178-975) located in Union, Illinois. Techalloy has completed the Corrective Action Implementation pursuant to RCRA Section 3008(h) Administrative Order on Consent dated 6 October 1999 and modification to the Order dated September 2001.

Corrective Measures Implementation required that Techalloy provide financial assurance for the implementation and operation and maintenance of the remediation systems. Techalloy has provided this financial assurance; however at this time Techalloy has completed the implementation phase of this Order. Therefore, Techalloy requests a revision to the financial assurance pertinent to only operation and maintenance of the remediation systems.

The enclosed table presents the remaining operation and maintenance activities and the projected cost. There are three remediation systems that require continued operation and maintenance: 1) air sparging/soil vapor extraction, 2) asphalt cap, and 3) groundwater extraction. It is estimated that based on current performance of the air sparging and soil vapor extraction systems that operation and maintenance activities will continue for three years. In accordance with the U.S. EPA Statement of Basis the asphalt cap will require a 30-year operation and maintenance. The cap has been in place for approximately three years, so financial assurance is estimated for a remaining 27 years. The final remediation system requiring operation and maintenance is the groundwater extraction system. This system has been operating since 1996 and based on observed decreasing concentrations and the fact that the on-site source area is being remediated, a remaining 14 years of operation and maintenance is projected. This is an estimate and revised estimates will be made in the future based on future analytical results.



Matrix Environmental, Inc.

Ms. Bhooma Sundar

-2-

2 September 2004

If you have any comments or questions regarding the progress of this project, please do not hesitate to call me at (847) 367-6835.

Sincerely,

Carlos J. Serna, P.G.

Matrix Environmental, Inc.

CJS:sk

Attachment

cc: David Williams, Techalloy

Henry Lopes, Techalloy Scott Carr, Techalloy

2003 Environmental Cost Estimate Techalloy Company, Inc. Union, Illinois

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1	Asphalt Cap	\$	10,000	\$	-	28	\$ 280,000
2	SVE and Sparging Systems	\$	10,000	\$	2,000	3	\$ 36,000
3	Groundwater Extraction system	\$	15,000	\$	2,500	14	\$ 245,000
	TOTAL	\$	35,000	\$	4,500		\$ 561,000



Matrix Environmental, Inc.

CONFIDENTIAL

RELEASED

C.M. - 2019-007454

July 7, 2020

TECHALLOY COMPANY, INC.

Techalloy Company, Inc. Olson and Jefferson Roads Union, Illinois

Streamlined Risk Evaluation (SRE)

September 2003

Prepared for:

Techalloy Company, Inc. 370 Franklin Turnpike Mahwah, New Jersey 07430

Prepared by:

Matrix Environmental, Inc. 357 North Milwaukee Avenue, Suite A Libertyville, Illinois 60048 To: scarr@techalloy.com

cc: carlos@matrixenviro.com

CC:

Subject: O&M issues related to Techalloy

Mr. Scott Carr Environmental Coordinator Techalloy Company, Inc 6509 Olson Road. P.O. Box 423 Union, IL 60180-0423

Scott,

I would like to know your availability and also Carlo's for a conference call to discuss the following issues:

- 1. Discussion of December 2003 sampling results with respect to fluctuations in the concentration of tetrachloroethylene(PCE) in highbridge monitoring well.
- 2. Exceedance of PCE in the highbridge monitoring well at a level of 130 ppb which is well above the 11 ppb screening criteria with respect to indoor vapor intrusion.
- 3. Possibility of including more wells for sampling in the next round of sampling. For eg., including CW-1D, CW-1S (to check if plume migration is contained) and one time sampling near the water table around the residences that are above the plume and exceed the screening criteria for PCE.
- 4. Providing documentation in the monthly reports, the resurfacing activities on the asphalt cap as and when the work is completed.
- 5. Discussion of risk associated with construction worker scenario and a residential indoor vapor intrusion with the development of Lechner's Propety located at the west of union and north of O' Cock road.

Bhooma Sundar
Toxicologist
RCRA Corrective Action
Enforcement and Compliance Assurance Branch
Waste, Pesticides and Toxics Division
USEPA Region 5
312-886-1660



Matrix Environmental, Inc.

355 North Milwaukee Avenue, Suite A Libertyville, Illinois 600480 Phone: 847-367-6835

Fax: 847-367-6845

Ms. Pamela Molitor
U.S. Environmental Protection Agency
Region V
RCRA Enforcement and Compliance Assurance Branch (DE-9J)
77 West Jackson Boulevard
Chicago, Illinois 60604

10 April 2002

Re:

Techalloy Site Progress Report for March 2002

Dear Ms. Molitor:

Enclosed please find the Monthly Progress Report for the Techalloy Company located in Union, Illinois for the month of March 2002. Also, enclosed are the effluent analytical results for this month.

If you have any comments or questions regarding the progress of this project, please do not hesitate to call me at (847) 548-8236.

Very truly yours,

Matrix Environmental, Inc.

Carlos J. Serna, P.G.

CJS:

Attachment

cc:

David Williams, Techalloy Henry Lopes, Techalloy Scott Carr, Techalloy Steve Hughes, Techalloy Kevin Lesko, IEPA Jacqueline Miller

To: Bhooma Sundar/R5/USEPA/US@EPA

03/10/04 04:05 PM

Subject: Fw: Techalloy

CC:

Hi, I am the attorney assigned to this matter. Though I've had no involvement since early 2002 when Techalloy was asking for some extra time to install the asphalt cap.

Today I received a call from a developer who is interested in some property that is North of O'Cock Road and East of Union Road. She wanted info. regarding the Techalloy site and how it might impact development of this piece of property. Looking at a map I have, it looks like there may be a pump/treat well in the vicinity of this piece of property.

Would you be able to update me on what is going on regarding CM implementation at the site, refresh my memory on where monitoring well and pump/treat wells are (and any other related off-site wells), and refresh my memory on where the GW plume has been detected (I can't recall if we know that it is off-site). Any documents, including maps, you could pull together for me to forward on to this person would also be a great help.

FYI, I work on Tuesdays, Wednesday, and Fridays. Thanks for the assistance.

---- Forwarded by Jacqueline Miller/R5/USEPA/US on 03/10/2004 04:01 PM -----

Allen Woitas

To: Jacqueline Miller/R5/USEPA/US

03/10/2004 03:43 PM

Subject: Re: Techalloy

Hi Jacqueline: New last name, but I think it's the former Jacqueline Kline. Advise me if I am wrong! Anyway, Bhooma Sundar is now assigned Techalloy. If I remember correctly, there are several documents showing the location of the wells including the recent (relatively speaking) Statement of Basis and Response to Comment. Bhooma should be able to locate the files for you. If you need me, let me know Allen

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SECTION 1

INTRODUCTION

This document presents a streamlined risk evaluation (SRE) conducted for the Techalloy Company, Inc. (Techalloy) located in Union, Illinois. The SRE was conducted to provide risk managers with a basis for evaluating whether action is warranted to mitigate potential health effects from the indoor vapor intrusion pathway. The U.S. Environmental Protection Agency (EPA) has requested that Techalloy assess the potential indoor vapor pathway.

Techalloy has completed a RCRA Facility Investigation (RFI), Corrective Measures Study (CMS), and Corrective Measures Implementation (CMI). The RFI was conducted to assess the soil and groundwater impacts associated with historical solid waste management units (SWMUS) located north of the manufacturing buildings. The sources of volatile organic compound (VOC) contamination to groundwater were the concrete evaporation pad and acid ponds. The sand and gravel aquifer is impacted from a depth of approximately 8 to 10 feet below the ground surface (bgs) and extents to approximately 30 to 60 bgs.

The CMI included the installation of a soil vapor extraction system, groundwater air sparging system, and asphalt cap. These systems are currently operating to remediate the VOC groundwater plume, VOCs in the soil in the unsaturated zone, as well as immobilize metals by preventing infiltration of precipitation and surface water.

The document is organized according to the five basic steps of a risk assessment (EPA 1989), listed below:

- Data Evaluation and Selection of Constituents of Potential Concern (COPCs). The first step in a risk assessment consists of reviewing and evaluating available data and identifying COPCs in the environmental media at the site.
- Exposure Assessment. An exposure assessment involves an analysis of potentially exposed human receptors, selection of appropriate intake assumptions, estimation of exposure point concentrations (EPCs), and estimation of chemical daily intakes.

- Toxicity Assessment. The toxicity assessment involves a review of agency literature and the subsequent compilation of cancer slope factors (SFs) and reference doses (RfDs) that are used to estimate cancer risks and noncancer hazard quotients (HQs).
- Risk Characterization. The risk characterization combines the results of the previous three risk assessment steps to quantitatively characterize potential cancer risks and noncancer adverse health effects to human health associated with exposure to COPCs.
- Uncertainty Analysis. The uncertainty analysis provides a discussion of key factors that may result in an over- or underestimation of risk.

SECTION 2

STREAMLINE RISK EVALUATION

2.1 <u>DATA EVALUATION AND SELECTION OF CONSTITUENTS OF POTENTIAL</u> CONCERN

The groundwater plume containing chlorinated VOCs is sampled semi-annually to assess the ongoing remediation systems. Data used in this evaluation was collected during the most recent semi-annual groundwater sampling event (June 2003). Wells sampled in 2003 included: MW-2, MW-4, MW-5D, MW-5, MW-6, MW-7, MW-9, Techwell #1, and MW-100 (Figure 1). The wells were analyzed for VOCs using Method SW 8260B. Only six VOCs (i.e., 1,1-dichloroethene, 1,1-dichloroethane, 1,1,1-trichloroethane, trichloroethene, tetrachloroethene, and cis-1,2-dichloroethene) were detected in the groundwater. Sampling results are presented in Table 1.

Data from wells MW-2, MW-5D; MW-5; MW-6; MW-7, and MW-9 were not used in this evaluation since these wells are not near the Techalloy building, rather they are located over 400 feet downgradient of the Techalloy building. An inhabited building is generally considered "near" subsurface contaminants if it is located within approximately 100 ft laterally or vertically of known or interpolated soil gas or groundwater contaminants (EPA 2002). The shallow well closest to the Techalloy Building (TechWell #1) reported no detections of VOCs. The VOCs measured in MW-4 and MW-100 were used to evaluate the vapor intrusion pathway since these wells are closest to the Techalloy building and did detect concentrations of chlorinated VOCs. Monitoring well MW-4 is located approximately 100 feet northwest of the Techalloy Plant's hazardous waste storage area and MW-100 is located about 250 feet north of the plant. The center of the groundwater plume (i.e., maximum detected concentrations) is located about 800 feet northwest of the plant.

2.2 EXPOSURE ASSESSMENT

The exposure of commercial/industrial workers to volatile chemicals in groundwater within the Techalloy facility was evaluated using risk-based concentrations (RBCs) for subsurface vapor intrusion indoors. Risk-based concentrations for the inhalation of indoor vapors from groundwater exposure were calculated using the Johnson and Ettinger (1991) model and GW_SCREEN spreadsheets (EPA 2003) developed by the U.S. EPA (*User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings (Revised, December 2000)*. The Johnson and Ettinger model incorporates both convective and diffusive mechanisms for estimating the transport of contaminant vapors emanating from groundwater and subsurface soils into indoor spaces located above the source of contamination. The Johnson and Ettinger model is a one-dimensional analytical solution to convective and diffusive vapor transport into indoor spaces and provides an estimated attenuation coefficient that relates the vapor concentration in the indoor space to the vapor concentration at the source of contamination. Inputs to the model include chemical properties of the contaminant, saturated and unsaturated zone properties, and structural properties of a building.

The GW SCREEN model calculates risk-based groundwater concentrations given a user-defined risk level. The target risk levels input into the model were 1 x 10⁻⁶ for estimating cancer risks and a target HQ of 1 for estimating noncancer effects. The default and site-specific properties were input in to the model and are presented in Table 2, including a soil type and a 15 centimeter (cm) depth below grade to the bottom of enclosed space floor for commercial/industrial land use (i.e., assuming a slab foundation). Exposure parameters for a commercial/industrial receptor based on IEPA (2002) guidance (i.e., exposure frequency of 250 days/yr and exposure duration of 25 years) were also used in developing risk-based concentrations for the commercial/industrial land use scenario. The GW SCREEN outputs represent acceptable exposure concentrations for assessing potential risks to commercial/industrial receptors. The GW SCREEN model is available on-line U.S. **EPA** at the website http://www.epa.gov/superfund/programs/risk/airmodel/johnson ettinger.htm. The GW SCREEN outputs for the COPCs are presented in Appendix A

2.3 TOXICITY ASSESSMENT

The development of vapor intrusion risk-based concentrations using GW_SCREEN values incorporates the results of a toxicity analyses; therefore a separate toxicity assessment was not required. A complete list of all toxicity values used to develop the GW_SCREEN values is provided with each spreadsheet (EPA 2003) and is presented in Appendix B. For some carcinogens, separate risk-based values are available to assess their carcinogenic effects and their noncancer effects (EPA 2003b). For these compounds, both the cancer risks and potential for noncancer health effects were evaluated.

2.4 RISK CHARACTERIZATION

To evaluate the indoor vapor inhalation pathway, maximum detected concentrations of volatile chemicals in groundwater were compared to risk-based concentrations developed using the GW_SCREEN spreadsheets. Total cancer risk estimates and noncancer hazard quotients (HQs) were calculated for the maximum detected concentration of each volatile organic constituent detected in groundwater at monitoring well MW-4 and MW-100.

2.5 NONCANCER EFFECTS

Noncancer effects were estimated for each VOC in groundwater using the following proportion equation:

 $HQ_i = (EPC_i \times nRBC_i^{-1}) \times 1$ where

HQi = Site related hazard quotient for chemical i (unitless)
 EPCi = Exposure Point Concentration for chemical i (ug/L)

 $nRBC_i = Noncancer risk-based concentration (ug/L).$

1 = Value of the RBC hazard quotient (the hazard quotient for all noncancer RBC is 1) (unitless).

A "total" noncancer estimate was calculated by summing the HQ_i values for detected VOCs. The resultant hazard index (HI) was then compared to a threshold value of 1 for adverse noncancer health effects.

2.6 CANCER RISKS

Cancer risks were estimated using the following equation:

 $CR_i = (EPC_i \times cRBC_i^{-1}) \times 10^{-6}$

where:

CR_i = Site-related excess lifetime cancer risk for chemical i (unitless)

 EPC_i = Exposure Point Concentration for chemical i (ug/L)

 $cRBC_i = Cancer-based risk-based concentration (ug/L)$

 10^{-6} = Value of the RBC cancer risk (the cancer risk associated with all cancer

RBCs is 10⁻⁵) (unitless)

A "total" cancer risk estimate was calculated by summing the CR_i values for detected VOCs. The resultant total cancer risk was then compared to a risk range of 10^{-6} to 10^{-4} .

SECTION 3

RESULTS AND CONCLUSIONS

3.1 RISK EVALUATION RESULTS

This section summarizes the SRE results for the Techalloy Plant. To aid in the interpretation of the results, the EPA states in the National Oil and Hazardous Substances Pollution Contingency Plan, that, "for known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual between 10⁻⁶ and 10⁻⁴"(Title 40 of the *Code of Federal Regulations* Part 300.430). Discussions of risks in this SRE are based on 10⁻⁶ to 10⁻⁴ risk management range for adverse cancer effects. The EPA directive titled "Role of Baseline Risk Assessment in the Superfund Remedy Selection Decisions," states that where cumulative cancer risks to an individual based on the Reasonable Maximum Exposure (RME) for both current and future land use is less than 10⁻⁴ and no adverse noncancer effects exist, action generally is not warranted unless adverse environmental impacts exist (EPA 1991c). For evaluating noncarcinogens, a segregated noncancer HQ of one or less indicates that little or no potential exists for adverse health effects (EPA 1989).

Total cancer risk estimates and noncancer HQs were calculated for the maximum detected concentration of each volatile organic constituent detected in groundwater at monitoring wells MW-4 and MW-100presented in Table 3 and Table 4, respectively. For MW-4, the cancer risk estimates for trichloroethene is 2.8-10⁻⁵ and for tetrachloroethene is 1.2-10⁻⁵, a total risk estimate of 4 x 10⁻⁵. For MW-100 a cancer risk estimate for tetrachloroethene is of 3 x 10⁻⁶. The noncancer HQs are less then one unit at both wells. It should be noted that these wells are located downgradient of the Techalloy Plant building and that no VOCs were detected in wells located adjacent to the building (i.e., TechWell #1).

3.2 CONCLUSIONS

The results of this streamline risk assessment conclude that vapor accumulation at potential indoor structures located 100 feet to 250 feet northwest (downgradient) of the existing Techalloy

buildings will not cause an adverse cancer or noncancer excess impact to commercial/industrial receptors. The incremental increase in cancer risk for suspected carcinogens are all within a manageable risk range (10⁻⁶ to 10⁻⁴) and all the incremental increase in noncancer risk are less than one and considered within an expectable hazardous quotient. It is concluded that no adverse excess indoor vapor inhalation impact exists at the Techalloy plant. It is further emphasized that the areas inside the Techalloy buildings are located upgradient of the existing plume and shallow groundwater is not impacted with VOCs.

3.3 UNCERTAINTY AND SENSIVITY ANALYSIS

The goal of an uncertainty analysis in a risk assessment is to provide to the appropriate decision makers (i.e., risk managers) a wide range of information about the key assumptions, their inherent uncertainty and variability, and the impact of this uncertainty and variability on the estimates of risk. This subsection describes the key assumptions used in this risk assessment that present a significant level of uncertainty to the risk estimates.

- Indoor air concentrations of vapors were not measured. The Johnson and Ettinger model was used to evaluate the indoor air exposure pathway. This model consists of a groundwater and/or vadose zone source of volatile vapors that diffuse upwards through unsaturated soils towards the surface. Under the model, the soil in the vadose zone is considered to be relatively homogeneous and isotropic. The receptors at the surface used in the model are in buildings with poured concrete foundations (e.g., basement or slab on grade foundations or crawlspaces with a liner or other vapor barrier). The underlying assumption for this model is that site-specific subsurface characteristics will tend to reduce or attenuate vapor concentrations as vapors migrate upward from the source and into structures. Site-specific factors may result in unattenuated or enhanced transport of vapors towards a receptor. Thus, the risk associated with indoor air exposure may be over-or underestimated depending on whether the site-specific subsurface characteristics reflect model assumptions. Since default soil parameters for a sand soil type were used in the model runs, which are more conservative than the model default soil type of a sandy clay, the risk-based concentrations are expected to be overestimated.
- Vapor concentrations generally decrease with increasing distance from a subsurface vapor source, and eventually at some distance the concentrations become negligible. The distance at which concentrations are negligible is a function of the mobility, toxicity and persistence of the chemical, as well as the

geometry of the source, subsurface materials, and characteristics of the buildings of concern. An inhabited building is generally considered "near" subsurface contaminants if it is located within approximately 100 ft laterally or vertically of known or interpolated soil gas or groundwater contaminants (EPA 2002) and the contamination occurs in the unsaturated zone and/or the uppermost saturated zone. The recommended lateral distance is supported by empirical data from Colorado sites where the vapor intrusion pathway has been evaluated. At these sites, no significant indoor air concentrations have been found in residences at a distance greater than one house lot (approximately 100 feet) from the interpolated edge of ground water plumes (EPA 2002). The highest VOC concentrations (except for 1.1-dichloroethene) were measured in monitoring wells located over 100 feet northwest (downgradient) of the Techalloy Plant. MW-4 is about 100 feet downgradient of the hazardous waste storage area and MW-100 is abbut 250 feet downgradient of the plant building. No VOCs were measured in wells directly adjacent to the plant building (TechWell #3). Thus, exposure and risk from the subsurface vapor intrusion pathway are expected to be overestimated since the contaminant plume is not near the plant building.

The Johnson and Ettinger groundwater model assumes an infinite source of contamination. However, the source of groundwater contamination is downgradient of the building. In addition, the model does not account for transformation processes (e.g., biodegradation, hydrolysis, etc.). Thus, groundwater concentrations would be decreasing over time; thus, these model assumptions will overestimate the indoor inhalation risk.

Soil vapor permeability (k_v) and soil water-filled porosity (θw) are two of the most sensitive model parameters associated with convective transport of vapors within the zone of influence of the building. An increase in k_v results an increase in the building concentration while an increase in θ w results in a decrease in building concentration (EPA 2000). Since site-specific data is lacking for these parameters, estimates of these values are made in the model based on the vadose zone soil type. A sandy soil was used to calculate the screening values used in this risk evaluation. However, the vadose zone soil type at the site varies, with a loamy topsoil layer present on the surface above the sand layer. Inputting a sandy loam soil type in the model results in risk-based concentrations of 1.73 ug/kg for TCE and 42.4 ug/kg for PCE, which are an order of magnitude higher than the risk-based concentrations for a sandy soil (0.193 ug/kg and 4.7 ug/kg, respectively). These risk-based concentrations for a sandy loam soil equate to a cancer risk of 4-10⁻⁷ at MW100 and 4-10⁻⁶ at MW-4 versus a cancer risk of 3-10⁻⁶ and 4-10⁻⁵, respectively. Thus, inputting a sandy soil type can overestimate the indoor inhalation risk by an order of magnitude. Data sheets for this sensitivity analysis are presented in Appendix C.

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- EPA. 2000. User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings. Revised, December 2000
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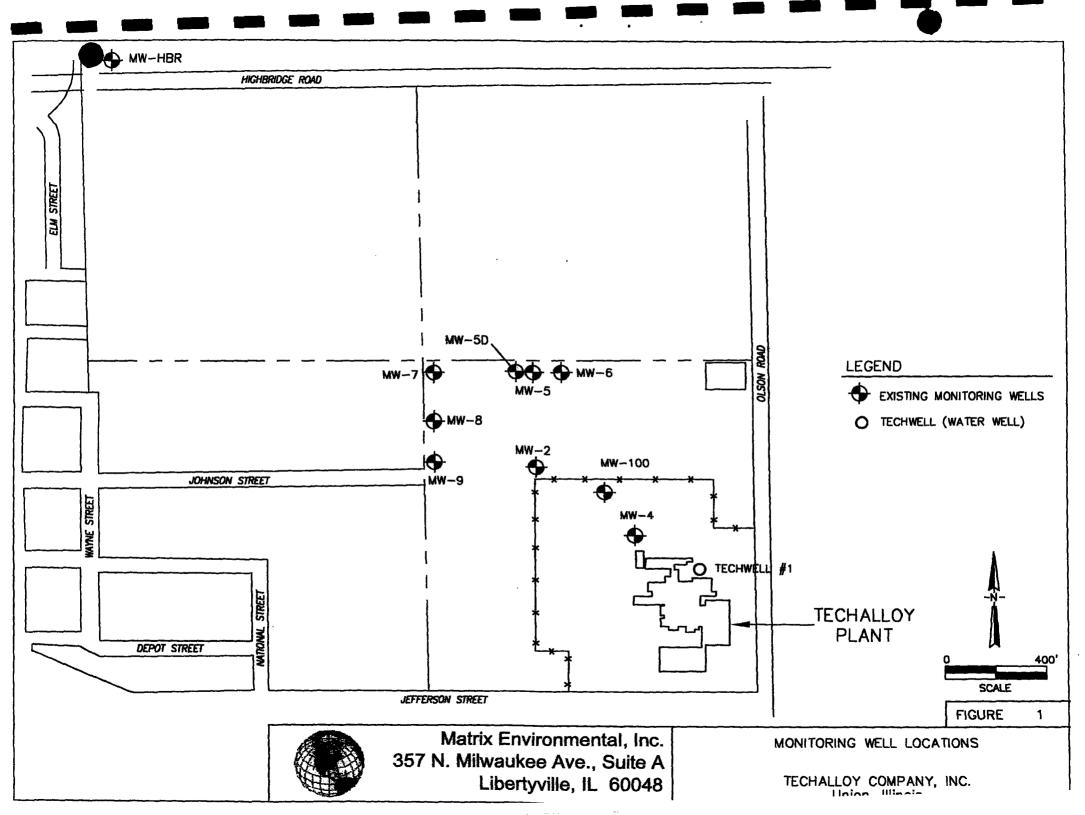


Table 1 2003 Monitoring Well Data All Concentrations in ug/L

Compound	MW-9	MW-7	MW-5D	MW-5S	MW-6	MW-2	MW-4	TechWell #1	MW-100
1,1-Dichloroethene	1 U	11	1.3	5	1 U	1 U	1 U	2 U	2 U
1,1-Dichloroethane	1 U	10	2.4	5 U	1 U	20	21	1 U	1 U
1,1,1-Trichloroethane	1 U	840	50	360	1 U	88	59	1 U	5.55
Trichloroethene	1 U	63	63	10	1 U	9.5	5.4	1 U	1 U
Tetrachloroethene	1 U	140	1 U	190	10.5	39	55	1 U	15.7
cis-1,2-Dichloroethene	1 U	10 U	1 U	5 U	1 U	16	1 U	1 U	1 U
cis-1,2-Dichloroethene	1 U	10 U	10	5 U	1 U	16	10	1 U	1 U

Wells sampled include MW-9;MW-7;MW-5D; MW-5S; MW-6; MW-2; and MW-4 (May 2003). TechWell #1 and MW-100 (June 2003)

Table 2
Johnson and Ettinger Indoor Air Model - Tier 1 Input Parameters
Techalloy Property Evaluation

Parar	meter	Units	Default Value	Value Used in Tier 1 Evaluation	Comments
T	Average Soil/Groundwater Temperature	Celsius	10	9.8	site-specific; Lechner Property Evaluation
Lwt	Depth below grade to water table Depth below grade to bottom of enclosed	cm	400	274	9 ft average depth to water table; RFI report
Lf	floor space Vadose zone SCS soil type or site-	cm	15 (slab)	15	site specific; slab foundation
K,	specific vapor permeability (cm2)	cm ²	1.00E-08	sand	site-specific; RFI Report
~ Qsoil BD,	SCS Soil type directly above water table Average vapor flow rate into building Vadose zone soil dry bulk density	– L/m g/cm³	sandy clay 5 1.5	sand calculated 1.66	site-specific; RFI Report leave blank for GW_SCREEN to calculate sand; GW_SCREEN
n _v	Vadose zone soil total porosity	unitless	0.43	0.375	sand; GW_SCREEN
Pw_v	Vadose zone water filled porosity	cm³/cm³	0.3	0.054	sand: GW_SCREEN
ATC ATno ED EF TR THQ	Averaging time - carcinogens Averaging time - noncarcinogens Exposure duration Exposure frequency Target risk - carcinogens Target hazard quotient - noncarcinogens	days days years days/year unitless unitless	70 yrs x 365 days/yr 30 yrs x 365 days/yr 30 yrs 350 1.00E-06	70 yrs x 365 days/yr 25 yrs x 365 days/yr 25 yrs 250 1.00E-06	Commercial/Industrial; IEPA TACO

Table 3 CANCER RISK AND HAZARD QUOTIENT EVALUATION: SUBSURFACE VAPOR INTRUSION INTO BUILDINGS FROM ON-SITE GROUNDWATER (MW-100)

Commercial/Industrial Receptor Techniloy, Union, Illinois

Chemical	Maximum Concentration	- Units	Risk	REEN (1) :-based ation (ug/L)	Cancer Risk (unitless)	Hazard Quotien
	(MW-100)		Cancer	Noncancer		
VOCs						
1,1-Dichloroethene	ND	ug/L		4.43E+02		
1,1-Dichloroethane	ND	ug/L		6.61E+03		,
1,1,1-Trichloroethane	6	ug/L		9.52E+03		5.8E-04
Trichloroethene	ND	ug/L	1.93E-01	3.04E+02		
Tetrachloroethene	16	ug/L	4.70E+00		3.3E-06	
cis-1,2-Dichloroethene	ND	ug/L		6.56E+02		
					3E-06	
(1) Risk-based soil concentration based	l on Johnson and Ettinger	Model (U.S	S. EPA, 2003).			6E-04

Ca - carcinogenic endpoint.

NC - noncarcinogenic endpoint.

Table 4 CANCER RISK AND HAZARD QUOTIENT EVALUATION: SUBSURFACE VAPOR INTRUSION INTO BUILDINGS FROM ON-SITE GROUNDWATER (MW-4)

Commercial/Industrial Receptor Techniloy, Union, Illinois

Chemical	Maximum Concentration	Units	Risk	REEN (1) -based ation (ug/L)	Cancer Risk (unitless)	Hazard Quotien
	(MW-4)		Cancer	Noncancer		<u> </u>
VOCs						
1,1-Dichloroethene	ND	ug/L		4.43E+02		
1,1-Dichloroethane	21	ug/L		6.61E+03		3.2E-03
1,1,1-Trichloroethane	59	ug/L		9.52E+03		6.2E-03
Trichloroethene	5.4	ug/L	1.93E-01	3.04E+02	2,8E-05	1.8E-02
Tetrachloroethene	55	ug/L	4.70E+00		1.2E-05	
cis-1,2-Dichloroethene	ND	ug/L		6.56E+02		
					4E-05	
(1) Risk-based soil concentration based	d on Johnson and Ettinge	r Model (U.	S. EPA, 2003).			3E-02

Ca - carcinogenic endpoint.

NC - noncarcinogenic endpoint.

APPENDIX A GW-SCREEN OUTPUT

APPENDIX 8-2 VLOOKUP TABLES

		Organic				nical Properties Loc									
		carbon partition	Diffusivity	Diffusivity	Pure component water	Henry's	Henry's law constant at reference	Henry's law constant reference	Normal boiling	Critical	Enthalpy of vaporization at the normal	Unit dsk	Reference		
		coefficient,	in air,	in water,	solubility,	law constant	temperature,	temperature,	point,	temperature,	boiling point,	factor,	conc.,	URF	RfC
CAS No.	Chaminal	K _{oc} (cm³/g)	D _a (cm²/s)	D _w (cm²/s)	S (===/L)	H'	H (atm-m³/moi)	T _R	Т _в (°К)	T _c (°K)	ΔH _{v,b}	URF (μg/m³) ⁻¹	RfC (mg/m³)	extrapolated	extrapolated
_ CAS NO.	Chemical	(Cin /g)	(Citt 16)	(CITI /S)	(mg/L)	(asettinu)	(auren /nor)	(°C)	(N)	(^)	(cal/mol)	(µg/m /	(mg/m/	(X)	(X)
56235 Cr	arbon tetrachioride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	558.60	7,127	1.5E-05	0.0E+00		
57749 Ch		1,20E+05	1.18E-02	4.37E-06	5. 6 0E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04		
	amma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	x	X
60297 Et 60571 Di		5,73E+00 2,14E+04	7.82E-02 1.25E-02	8.61E-06 4.74E-06	5.68E+04 1.95E-01	1.35E+00 6.18E-04	3.29E-02		307.50	486.74	6,338	0.0E+00 4.6E-03	7.0E-01 1.8E-04		X X
67841 Ac		5.75E-01	1.23E-02 1.24E-01	1.14E-05	1.00E+06	1.59E-03	1.51E-05 3.87E-05	25 25	613.32 329.20	842.25 508.10	17,000 6,955	4.6E-03 0.0E+00	3.5E-01		â
67663 Ch		3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32		6,988	2.3E-05	0.0E+00		
67721 He	exachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06			×
71432 Be	enzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	0.0E+00		
	1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02		347.24	545.00	7,136	0.0E+00	2.2E+00		
	ethaxychlor DE	9.77E+04	1.56E-02	4.48E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02		16,000	0.0E+00	1.8E-02	v	Х
72559 DE		4.47E+06 1.05E+01	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05		Х	
	ethyl bromide ethyl chloride (chloromethane)	2.12E+00	7.28E-02 1.28E-01	1.21E-05 6.50E-06	1.52E+04 5.33E+03	2.55E-01 3.61E-01	6.22E-03 8.80E-03	25 25	276.71 249.00	467.00 416.25	5,714 5,115	0.0E+00 1.0E-06	5.0E-03 9.0E-02		
	ydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25 25	249.00		5,115 6,676	0.0E+00	3.0E-02		
	ethylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25 25	370.00		7,868	0.0E+00	3.5E-02		x
75003 Ch	hioroethane (ethy) chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30		5,879	8.3E-07	1.0E+01	×	
	inyl chloride (chloroethene)	1.86E+01	1.08E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02		259.25	432.00	5,250	8.8E-06	1.0E-01		
75058 Ac		4.20E+00	1.28E-01	1.66E-05	1.00E+08	1.42E-03	3.45E-05	25	354.60		7,110	0.0E+00			
	cetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05		293.10		6,157	2.2E-06			
	ethylene chloride arbon disuifide	1.17E+01 4.57E+01	1.01E-01 1.04E-01	1.17E-05 1.00E-05	1.30E+04 1.19E+03	8.96E-02 1.24E+00	2.18E-03	25	313.00		6,706		3.0E+00		
	thylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	3.02E-02 5.54E-04	25 25	319.00 283.60		6,391 6,104	0.0E+00 1.0E-04			
75252 Br		8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25 25	422,35		9,479	1.0E-04 1.1E-06			x
	romodichioromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15		7,800	1.8E-05		x	x
75296 2-0	Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02		308.70		6,286	0.0E+00			
	1-Dichloroethane	3.16E+01	7.42E-02	1.05E -0 5	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01		
	1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02		304.75		6,247	0.0E+00			
	hlorodifiuoromethane ichlorofiuoromethane	4.79E+01 4.97E+02	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02		232.40		4,836	0.0E+00			
	chlorodifluoromethane	4.97E+02 4.67E+02	8.70E-02 6.65E-02	9.70E-06 9.92E-06	1.10E+03 2.80E+02	3.97E+00 1.40E+01	9.68E-02	25	296.70		5,999	0.0E+00			
	1,2-Trichloro-1,2,2-trifluoroethar	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	3.42E-01 4.80E-01	25 25	243.20 320.70		9,421 6,463	0.0E+00 0.0E+00			
76448 He		1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25 25	603.69		13,000	1.3E-03			x
	exachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-08	1.80E+00	1.10E+00	2.69E-02		512,15		10,931	0.0E+00			^
78831 iso		2.59E+00	8.60E-02	9.30E-06	8,50E+04	4.83E-04	1.18E-05		381.04		10,936	0.0E+00			x
	2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52		7,590	1.9E-05	4.0E-03	×	
	ethylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05		352.50		7,481	0.0E+00			
	1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15		8,322	1.6E-05			×
	ichloroethylene ethyl acetate	1.66E+02 3.26E+00	7.90E-02 1.04E-01	9.10E-06 1.00E-05	1.47E+03 2.00E+03	4.21E-01 4.84E-03	1.03E-02 1.18E-04		380.38 329.80		7,505 7,280	1.1E-04 0.0E+00		х	x
	1,2,2-Tetrachioroethane	9,33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	1.16E-04 3.44E-04	25 25	329.80 419.60		7,260 8.996	5.8E-05			X
79469 2-1	Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25 25	393.20		8,383	2.7E-03			•
80626 Me	ethylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373,50		8,975				
	enaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01		x
88737 Flu		1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05		570.44		12,666				×
	exachloro-1,3-butadiene	5,37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03		486.15		10,206				X
	Nitrotoluene aphthalene	3.24E+02 2.00E+03	5.87E-02 5.90E-02	8.67E-06 7.50E-06	6.50E+02 3.10E+01	5.11E-04 1.98E-02	1.25E-05 4.82E-04	25 25	495.00 491.14		12,239				Х
	Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	4.82E-04 5.17E-04		491.14 514.26		10,373 12,600	0.0E+00 0.0E+00			Y
92524 Bip		4,38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04		529.10		10,890				â
95476 o-)		3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03		417.60		8,661				x
95501 1,2	2-Dichlombenzene	6.17E+02	6.90E-02	7.90E-06	1.58E+02	7.77E-02	1.90E-03		453.57		9,700				
	Chlarophenol	3.88E+02	5.01E-02	9.48E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572		1.8E-02		X
	2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03		442.30		9,369				
	2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04		430.00		9,171			X	
	ethyl acrylate hylmethacrylate	4.53E+00 2.95E+01	9.76E-02 6.53E-02	1.02E-05 8.37E-06	6.00E+04 3.87E+03	7.68E-03 3.44E-02	1.87E-04 1 of 2 8.40E-04		353.70		7,749			9/15/20	na V
	nymetriacrylate rt-Butylbenzene	7.71E+02	5.65E-02	8.02E-08	2.95E+01	3.44E-02 4.87E-01	01-102-0-1		390.00		10,957			ar 13120	
IDI	imene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.19E-02 1.16E+00		442.10 425.56		8,980 10,335				X

APPENDIX B-2 VLOOKUP TABLES

Control cathons	Chemical Properties Lookup Table														
Control partition Dillarity Dillarity Dillarity Control partition Dillarity Dillarity Control partition Dillarity Dillarity Control partition Dillarity Dillarity Control partition Dillarity Dill		Organic						Henry's			Enthalov of				
Partition Diffaulty Diffaulty Indirect Henry's at animance Indirect Henry's Indirect Henry's Indirect Henry's Indirect Henry's Indirect Henry's Indirect Indirect Henry's Indirect Indirect Henry's Indirect Indirect Henry's Indirect	1	carbon			component				Normal			Unit			
CAB No. Chartest	}	partition	Diffusivity	Diffusivity		Henry's				Critical	•		Reference		
CAS No. Dismital Control Con	ł		in air,	•		•								URF	RfC
CAS No. Chamcal (cm²g) (cm²n) (cm²n		Km	D_a	D.,,	S	H"	Н	Tp	Ta	`T _C		URF	RfC	extrapolated	extrapolated
96862 Aestophenone 5.77E=101 6.06E=202 8.78E=06 6.13E=103 4.38E=04 1.07E=06 55 47E,00 709.60 11,720 0.0E=100 3.8E=01 10041 100	CAS No. Chemical	_	= =		(mall)	(unitiase)	(atm-m³/mol)		-			(ua/m³\-1	_		(X)
Bel653 Nitrobarranne	CHO IVO.	(0	(5		(Hight-)	Тинцова	(auto in interf	10/			(Capinol)	(Page 111)	137		
B9853 Nitroberstranne	98862 Acetophenone	5.77F+01	6.00F-02	8 73F-06	6 13F+03	4.38F-04	1 07E-05	25	475.00	709.50	11 732	0.0E+00	3.5F-01		x
100444 Elsylhenzene 3.68E-02 7.56E-02 7.56E-02 8.22E-01 7.66E-03 25.40E-03 1.1E-00 1.0E-04 1.0E-															
100425 Symme															
100447 Emmylehondre															
100827 Emrasterlysis	1														
103851 n-Popylinbrixane													3.5E-01		X
104518 Ashlylmenzane													1.4E-01		X
109423 p-Xy/mine 3,88E+02 7,68E-02 8,44E-00 1,8EE+02 3,13E-01 7,44E-03 25 411,52 619,20 8,255 0,0E+00 7,0E+00 1,0E+00		1.11E+03	5.70E-02	8,12E-06	2.00E+00	5.38E-01						0.0E+00	1.4E-01		X
109467 4-Delintosharame 6,175-102 6,005-02 7,005-04 7,		3.89E+02	7.69E-02		1.85E+02	3.13E-01							7.0E+00		Х
108994 1,2-Disconsishane (ethylene dilb** 2.50E+01** 2.17E+02** 1.19E-06** 4.19E-03** 3.01E+00** 7.34E-02** 2.88.60** 4.85.00** 5.370** 2.2E-04** 2.0E+00** 1.00E+00** 1.00E+01** 1.00E		6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02				684.75		0.0E+00	8.0E-01		
107028 Acrolein		r 2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04		
177062 1,2-Olchioneshrane	108990 1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3,01E+00	7.34E-02	25	268.60	425.00	5,370	2.8E-04			
197131 Acytonitrie							1.22E-04		325.60	506.00	6,731				
108054 Viryl acetate 5.25E+00 8.50E+02 9.20E+06 2.00E+04 2.00E+02 5.10E+04 5.34E+03 1.38E+04 25 348.56 519.13 7.800 0.0E+00 2.0E+01 1.08E+03 1.38E+04 25 348.56 519.13 7.800 0.0E+00 2.0E+01 1.08E+03 1.38E+04 2.0E+02 7.00E+02 7.00E+03 7.30E+03 25 412.27 617.05 8.523 0.0E+00 7.0E+03 1.08E+03 7.30E+03 7.30E	107062 1,2-Dichloroethane					4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05			
109101 Methylicobuly/liedone (4-methyl-2										519.00					
108878 7,00F=02 7,00F=02 7,00F=06 1.61F=02 3,00F=01 7,32F=03 25 412,27 617,06 8,523 0,0F=00 7,0F=00 1,08F=01 1,36F=01 3,36F=01 7,36F=04 4,22F=00 1,08F=01 5,87F=03 25 437,89 637,25 20,27 7,47 0,0F=00 0,0F=00 1,08F=01 1,08F=01 7,36F=04 8,0F=00 8,0F=00 8,0F=00 3,0F=00 1,08F=01 1,08F=01 7,36F=04 4,22F=00 1,08F=01 25 373,90 572,20 7,47 0,0F=00 0,0F=00 0,0F=00 1,08F=01									345.65						
108678 1,3,5,7,1methylbanzane 1,35,6,0 6,0,0,0,0 2,416,0,1 5,276,0 2,478,0 6,0,0,0,0 6,0,0,0,0 6,0,0,0 6,0,0,0 6,0,0,0 6,0,0,0 6,0,0,0 6,0,0,0 6,0,0,0 6,0,0,0,0 6,0,0,0,0 6,0,0,0,0 6,0,0,0,0 6,0,0,0,0 6,0,0,0,0 6,0,0,0,0 6,0,0,0,0 6,0,0,0,0 6,0,0,0,0,0 6,0,0,0,0 6,0,0,0,0 6,0,0,0,0 6,0,0,0,0 6,0,0,0,0,0 6,0,0,0,0,0 6,0,0,0,0,0 6,0,0,0,0,0 6,0,0,0,0,0 6,0,0,0,0,0 6,0,0,0,0,0,0 6,0,0,0,0,0 6,0,0,0,0,0,0 6,0,0,0,0,0,0 6,0,0,0,0,0,0,0 6,0,0,0,0,0,0,0 6,0,0,0,0,0,0,0 6,0,0,0,0,0,0,0 6,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0															
108872 Methylycylorhoxane	•														×
108883 Tollone															
108897 Chlorobenzene											.,				
108693 1-Chilorobutane											•				
110009 Furan 1.88E+01 1.04E-01 1.22E-05 1.00E+04 2.21E-01 5.30E-03 25 304.80 490.20 8,477 0.0E+00 3.5E-03 110543 Haxane 4.44E+01 2.0E-01 1.68E+01 5.30E-03 25 304.80 4.90.20 8,477 0.0E+00 2.0E-01 115497 Endosulina 1.55E+01 6.92E-07 7.53E-04 1.72E+04 7.38E-04 1.80E-06 25 451.15 895.79 10.803 3.3E-04 0.0E+00 115597 Endosulina 2.14E+03 1.15E-02 4.55E-06 5.0E-03 5.0E-03 1.22E-04 1.92E-06 25 674.43 942.94 14,000 0.0E+00 2.14E-03 1.15E-04 4.58E-04 1.12E-06 25 674.43 942.94 14,000 0.0E+00 2.14E-03 1.15E-04 4.58E-04 1.12E-06 25 674.43 942.94 14,000 0.0E+00 2.1E-02 1.18E-03															
110543 Husane											•				X
111444 Bile/2-chloroesthylpsther 1.55E+01 8.9Ze-02 7.58E-08 1.7ZE+04 7.38E-04 1.80E-05 25 451.15 859.79 10,803 3.3E-04 0.0E+00 115297 Endoesulfan 2.14E+03 1.15E-02 4.55E-08 5.10E-01 4.58E-04 1.12E-05 25 674.83 942.94 14,000 0.0E+00 2.1E-02 116741 Hexachlorobenzene 5.50E+04 5.4ZE-02 5.91E-06 5.00E-03 5.40E-02 1.3ZE-03 25 652.55 825.00 14,447 4.6E-04 2.8E-03 120SE21 1.2,4-Tinchlorobenzene 1.778E+03 3.00E-02 8.23E-06 4.88E+01 5.81E-02 1.3ZE-03 25 682.55 825.00 10,471 0.0E+00 0.0E+00 0.0E+00 129799 Ortolorablethyles (2-bushers) 4.8EE-03 1.0E-05 2.8GE-04 1.0E-05 2.8GE-04 1.9E-05 25 375.20 588.00 10,471 0.0E+00 0	***														x
116297 Endesulfan 2.14E-03 1.15E-02 4.55E-06 5.0E-01 4.58E-04 1.12E-06 25 674.43 942.94 1.4,000 0.0E-00 2.1E-02 118741 Hexachlorobenzene 5.56E-04 5.62E-02 5.01E-06 5.0E-03 5.0E-02 1.32E-03 25 682.55 825.00 14,447 4.6E-04 2.8E-03 120821 1,2.4-Trichlorobenzene 1.78E+03 3.0E-02 8.28E-06 4.88E+01 7.9BE-04 1.9SE-05 25 488.15 725.00 11,477 0.0E+00 2.0E-01 123739 Criotonaldehyde (2-butenal) 4.82E+00 9.58E-02 1.07E-05 3.68E+04 7.9BE-04 1.9SE-05 25 375.20 568.00 9 5.4E-04 0.0E+00 X 1244451 Chilorobitomormethane 6.31E-01 1.0SE-05 2.56E+04 1.0SE-05 2.58E+04 1.0SE-05 2.58E+04 25 383.30 554.00 7,0E-04 2.2E-03 X 126B97 Methacylonitrile 3.58E-01 1.12E-01 1.0SE-05 2.54E+04 1.0TE-02 2.46E-04 25 383.30 554.00 7,0E-0 0.0E+00 7.0E-04 1.2BE-03 2.5EE-03 1.2BE-03															
118741 Haxachlorobenzene 5.50E+04 5.42E-02 5.91E-06 5.00E-03 5.40E-02 1.32E-03 25 682.55 825.00 14,447 4.6E-04 2.8E-03 120821 1,2,4-Trinchlorobenzene 1.78E+03 3.00E-02 1.07E-05 3.69E+04 7.99E-04 1.99E-05 25 375.20 568.00 9 5.4E-04 0.0E+00 X 123739 Crotonaldehyde (2-butenal) 4.82E+00 9.56E-02 1.07E-05 3.69E+04 7.99E-04 1.99E-05 25 375.20 568.00 9 5.4E-04 0.0E+00 X 126967 Methacorylonizille 3.56E+01 1.99E-02 1.05E-05 2.80E+04 25 363.30 554.00 7.00E-00 7.0E-02 X 126967 Methacorylonizille 3.56E+01 1.2E-01 1.32E-05 2.50E+03 3.20E-02 2.4E-04 25 383.30 554.00 7.00 0.0E+00 7.0E-04 126968 2-Chloro-1,3-butadiene (chloropre 6.73E+01 8.58E-02 1.03E-05 2.12E+03 4.91E-01 1.20E-02 25 332.40 525.00 8.075 0.0E+00 7.0E-03 127184 Tetrachloroethylene 1.55E+02 7.20E-02 8.20E-06 2.00E+02 7.53E-01 1.28E-02 25 394.40 620.20 8.288 3.0E-06 0.0E+00 129000 Pyrsne 1.05E+05 2.72E-02 7.24E-08 1.35E+00 4.50E-04 1.10E-05 25 667.95 938 14370 0.0E+00 1.4E-02 13988 sec-Butylbenzene 9.66E+02 5.70E-02 8.12E-06 3.94E+00 1.28E-01 1.28E-02 5 364.00 620.0E+00 1.4E-01 1.4E-01 1.49E-02 25 446.5 679 8370 0.0E+00 1.4E-01 1.4E-01 1.49E-02 25 446.5 679 8370 0.0E+00 1.4E-01 1.44T88 Ethylacetate 8 8.44E+00 7.32E-02 9.70E-06 8.03E+04 5.68E-01 1.38E-02 25 360.26 523.3 7633.60 0.0E+00 1.4E-01 1.44T88 Ethylacetate 8 8.44E+00 7.33E-02 9.70E-06 8.03E+04 5.68E-01 1.38E-02 25 330.36 544 7192 0.0E+00 7.0E-02 1.56805 ten-1,2-Dichloroethylene 5.25E+01 7.07E-02 1.18E-05 6.30E+03 3.87E-03 9.84E-01 9.36E-03 25 330.85 544 7192 0.0E+00 7.0E-02 2.56E-02 1.56805 ten-1,2-Dichloroethylene 3.55E+01 7.07E-02 1.18E-05 6.30E+03 3.87E-03 9.84E-01 9.36E-03 25 330.85 544 7192 0.0E+00 7.0E-02 2.56E-02 1.56805 ten-1,2-Dichloroethylene 3.55E+01 7.07E-02 1.18E-05 6.30E+03 3.87E-03 9.44E-05 25 714.15 979 16455 2.1E-04 0.0E+00 X 2.16019 Chrysne 3.68E+05 2.26E-02 5.66E-06 1.50E-03 1.70E-02 5.66E-03															.,
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135988 sec-Butylbenzene 9.68E+02 5.70E-02 8.12E-06 3.94E+00 5.68E-01 1.39E-02 25 446.5 679 88730 0.0E+00 1.4E-01 1.41786 Ethylacetate 6.44E+00 7.32E-02 9.70E-06 8.03E+04 5.64E-03 1.38E-04 25 350.26 523.3 7633.66 0.0E+00 3.2E+00 1.56692 cls-1,2-Dichloroethylene 3.55E+01 7.07E-02 1.19E-05 6.30E+03 1.67E-01 4.07E-03 25 333.65 544 7192 0.0E+00 3.5E-02 1.56605 trans-1,2-Dichloroethylene 5.25E+01 7.07E-02 1.19E-05 6.30E+03 3.84E-01 9.36E-03 25 320.85 516.5 6717 0.0E+00 7.0E-02 1.50E-03 4.54E-03 1.11E-04 25 715.9 969.27 17000 2.1E-04 0.0E+00 X 218019 Chrysene 3.98E+05 2.48E-02 6.21E-06 6.30E-03 3.87E-03 9.44E-05 25 714.15 979 1.6455 2.1E-06 0.0E+00 X 319846 alpha-HCH (alpha-BHC) 1.23E+06 1.32E-02 4.88E-06 1.70E-02 6.95E-03 1.70E-04 25 603.01 839.37 15000 4.9E-03 1.1E-04 319846 alpha-HCH (alpha-BHC) 1.23E+03 6.92E-02 7.88E-06 1.34E+02 1.27E-01 3.09E-03 25 381.15 587.38 7900 4.0E-00 1.1E-01 542756 1,3-Dichloropropene 4.57E+01 6.28E-02 7.09E-06 1.10E+03 9.90E-02 2.41E-03 25 403.5 624 9768.28525 7.4E-08 1.1E-01	132649 Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04									X
141786 Ethylacetate 6.44E+00 7.32E-02 9.70E-06 8.03E+04 5.64E-03 1.38E-04 25 350.26 523.3 7633.66 0.0E+00 3.2E+00 1565692 cls-1,2-Dichloroethylene 3.55E+01 7.36E-02 1.13E-05 3.50E+03 1.67E-01 4.07E-03 25 333.65 544 7192 0.0E+00 3.5E-02 156605 trans-1,2-Dichloroethylene 5.25E+01 7.07E-02 1.19E-05 6.30E+03 3.84E-01 9.36E-03 25 320.85 516.5 671 0.0E+00 7.0E-02 205992 Benzo(b)fluoranthene 1.23E+06 2.26E-02 5.56E-06 1.50E-03 4.54E-03 1.11E-04 25 715.9 969.27 1700 2.1E-04 0.0E+00 X 218019 Chrysene 3.98E+05 2.48E-02 6.21E-06 6.30E-03 3.87E-03 9.44E-05 25 714.15 979 16455 2.1E-06 0.0E+00 X 319846 alpha-HCH (alpha-BHC) 1.23E+06 1.32E-02 4.88E-06 1.70E-02 6.95E-03 1.70E-04 25 603.01 839.37 15000 4.9E-03 1.1E-04 319846 alpha-HCH (alpha-BHC) 1.23E+03 1.42E-02 7.34E-06 2.00E+00 4.34E-04 1.08E-05 25 598.55 839.36 15000 1.8E-03 0.0E+00 541731 1,3-Dichlorobenzene 1.98E+03 6.92E-02 7.86E-06 1.34E+02 1.27E-01 3.09E-03 25 381.15 587.38 7900 4.0E-06 2.0E-02 630206 1,1,1,2-Tetrachloroethane 1.16E+02 7.10E-02 7.90E-06 1.10E+03 9.90E-02 2.41E-03 25 403.5 624 9768.285255 7.4E-08 1.1E-01	135988 sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5,68E-01									X
158605 trans-1,2-Dichloroethylene 5.25E+01 7.07E-02 1.19E-05 6.30E+03 3.84E-01 9.36E-03 25 320.85 516.5 6717 0.0E+00 7.0E-02 205892 Benzo(b)fluoranthene 1.23E+08 2.26E-02 5.58E-06 1.50E-03 4.54E-03 1.11E-04 25 715.9 969.27 17000 2.1E-04 0.0E+00 X 218019 Chrysene 3.98E+05 2.48E-02 6.21E-06 6.30E-03 3.87E-03 9.44E-05 25 714.15 979 16455 2.1E-06 0.0E+00 X 309002 Aldrin 2.45E+06 1.32E-02 4.88E-06 1.70E-02 6.95E-03 1.70E-04 25 603.01 839.37 15000 4.9E-03 1.1E-04 319846 alpha-HCH (alpha-BHC) 1.23E+03 1.42E-02 7.34E-06 2.00E+00 4.34E-04 1.08E-05 25 596.55 839.36 15000 4.9E-03 0.0E+00 541731 1,3-Dichlorophopene 1.98E+03 6.92E-02 7.86E-06 1.34E+02 1.27E-01 3.09E-03 25 448 684 9230.18 0.0E+00 1.1E-01 542756 1,3-Dichlorophopene 4.57E+01 6.28E-02 7.00E-05 1.10E+03 9.90E-02 2.41E-03 25 403.5 624 9768.282525 7.4E-08 1.1E-01		6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3,2E+00)	X
205992 Benzo(b)fluoranthene 1.23E+06 2.26E-02 5.56E-06 1.50E-03 4.54E-03 1.11E-04 25 715.9 969.27 17000 2.1E-04 0.0E+00 X 218019 Chrysene 3.98E+05 2.48E-02 6.21E-06 6.30E-03 3.87E-03 9.44E-05 25 714.15 979 16455 2.1E-06 0.0E+00 X 309002 Aldrin 2.45E+06 1.32E-02 4.88E-06 1.70E-02 6.95E-03 1.70E-04 25 603.01 839.37 15000 4.9E-03 1.1E-04 319846 alpha-HCH (alpha-BHC) 1.23E+03 1.42E-02 7.34E-06 2.00E+00 4.34E-04 1.06E-05 25 596.55 839.36 15000 1.8E-03 0.0E+00 541731 1,3-Dichlorobenzene 1.98E+03 6.92E-02 7.88E-06 1.34E+02 1.27E-01 3.09E-03 25 448 684 9230.18 0.0E+00 1.1E-01 542756 1,3-Dichloropropene 4.57E+01 6.26E-02 1.00E-05 2.80E+03 7.24E-01 1.77E-02 25 381.15 587.38 7900 4.0E-06 2.0E-02 630206 1,1,1,2-Tetrachloroethane 1.16E+02 7.10E-02 7.90E-06 1.10E+03 9.90E-02 2.41E-03 25 403.5 624 9768.282525 7.4E-08 1.1E-01	156592 cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	!	X
218019 Chrysene 3.98E+05 2.48E-02 6.21E-06 6.30E-03 3.87E-03 9.44E-05 25 714.15 979 16455 2.1E-06 0.0E+00 X 309002 Aldrin 2.45E+06 1.32E-02 4.88E-06 1.70E-02 6.95E-03 1.70E-04 25 603.01 839.37 15000 4.9E-03 1.1E-04 319848 alpha-HCH (alpha-BHC) 1.23E+03 1.42E-02 7.34E-06 2.00E+00 4.34E-04 1.06E-05 25 598.55 839.36 15000 1.8E-03 0.0E+00 541731 1,3-Dichlorobenzene 1.98E+03 6.92E-02 7.86E-06 1.34E+02 1.27E-01 3.09E-03 25 446 684 9230.18 0.0E+00 1.1E-01 542756 1,3-Dichloropropene 4.57E+01 6.26E-02 1.00E-05 2.80E+03 7.24E-01 1.77E-02 25 381.15 587.38 790 4.0E-06 2.0E-02 630206 1,1,1,2-Tetrachloroethane 1.16E+02 7.10E-02 7.90E-06 1.10E+03 9.90E-02 2.41E-03 25 403.5 624 9768.282525 7.4E-08 1.1E-01	156605 trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02	2	X
309002 Aldrin 2.45E+06 1.32E-02 4.88E-06 1.70E-02 6.95E-03 1.70E-04 25 603.01 839.37 15000 4.9E-03 1.1E-04 319846 alpha-HCH (alpha-BHC) 1.23E+03 1.42E-02 7.34E-06 2.00E+00 4.34E-04 1.08E-05 25 598.55 839.36 15000 1.8E-03 0.0E+00 541731 1,3-Dichlorobenzene 1.98E+03 6.92E-02 7.86E-06 1.34E+02 1.27E-01 3.09E-03 25 448 684 9230.18 0.0E+00 1.1E-01 542756 1,3-Dichloropropene 4.57E+01 6.26E-02 1.00E-05 2.80E+03 7.24E-01 1.77E-02 25 381.15 587.38 7900 4.0E-06 2.0E-02 630206 1,1,1,2-Tetrachloroethane 1.16E+02 7.10E-02 7.80E-06 1.10E+03 9.90E-02 2.41E-03 25 403.5 624 9768.282525 7.4E-06 1.1E-01	205992 Benzo(b)fluoranthene			5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00) X	
319846 alpha-HCH (alpha-BHC) 1.23E+03 1.42E-02 7.34E-06 2.00E+00 4.34E-04 1.06E-05 25 596.55 839.36 15000 1.8E-03 0.0E+00 541731 1,3-Dichlorophenzene 1.98E+03 6.92E-02 7.86E-06 1.34E+02 1.27E-01 3.09E-03 25 448 684 9230.18 0.0E+00 1.1E-01 542756 1,3-Dichlorophene 4.57E+01 6.26E-02 1.00E-05 2.80E+03 7.24E-01 1.77E-02 25 381.15 587.38 7900 4.0E-06 2.0E-02 630206 1,1,1,2-Tetrachloroethane 1.16E+02 7.10E-02 7.90E-06 1.10E+03 9.90E-02 2.41E-03 25 403.5 624 9768.282525 7.4E-08 1.1E-01							9.44E-05		714.15	979	16455		0.0E+00) X	
541731 1,3-Dichlorobenzene 1.98E+03 6.92E-02 7.86E-06 1.34E+02 1.27E-01 3.09E-03 25 448 684 9230.18 0.0E+00 1.1E-01 542756 1,3-Dichloropropene 4.57E+01 6.26E-02 1.00E-05 2.80E+03 7.24E-01 1.77E-02 25 381.15 587.38 7900 4.0E-06 2.0E-02 630206 1,1,1,2-Tetrachloroethane 1.16E+02 7.10E-02 7.90E-06 1.10E+03 9.90E-02 2.41E-03 25 403.5 624 9768.282525 7.4E-08 1.1E-01							1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	ļ	X
542756 1,3-Dichloropropene 4.57E+01 6.26E-02 1.00E-05 2.80E+03 7.24E-01 1.77E-02 25 381,15 587,38 7900 4.0E-06 2.0E-02 630206 1,1,1,2-Tetrachloroethane 1.16E+02 7.10E-02 7.90E-06 1.10E+03 9.90E-02 2.41E-03 25 403.5 624 9768,282525 7.4E-08 1.1E-01							1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00)	
630206 1,1,1,2-Tetrachloroethane 1.16E+02 7.10E-02 7.80E-06 1.10E+03 9.90E-02 2.41E-03 25 403.5 624 9768.282525 7.4E-08 1.1E-01							3.09E-03		446	684	9230.18	0.0E+00	1.1E-01		×
111111111111111111111111111111111111111															
I 1634044 MTBE 7.28E+00 1.02E-01 1.05E-05 5.10E+04 2.58E-02 8.23E-04 25 328.3 407.4 8877.88 0.0E-00 3.0E-00															×
						2.58E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00		
7439976 Mercury (elemental) 5.20E+01 3.07E-02 6.30E-06 2.00E+01 4.40E-01 1.07E-02 25 629.88 1750 14127 0.0E+00 3.0E-04	7439976 Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04	ı	

APPENDIX B

TOXICITY VALUES

DATA ENTRY SHEET

GW-SCREEN Version 3.0; 04/03 Reset to Defaults		YES [OR ROM ACTUAL GE	RATION (enter "X" in "YI ROUNDWATER CONCEI	-		
	ENTER Chemical CAS No. (numbers only, no dashes)	YES ENTER Initial groundwater conc., Cw (ug/L)		chemical			
	75343			chloroethene			
MORE ¥	ENTER Depth below grade to bottom of enclosed space floor, L _f (cm)	Depth below grade to water table, Lwr (cm)	SCS soil type directly above water table	ENTER Average soli/ groundwater temperature, Ts (°C)		ENTER Average vapor flow rate into bldg. ave blank to calcular Q _{adl} (L/m)	te)
	15	274	s	9.8]		
MORE ↓	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vendose zone soil vapor permeability, k _v (cm ²)	ENTER Vadose zone SCS soil type Lookup Soil Perumelers	ENTER Vadose zone soil dry bulk density, Pb V (g/cm²)	ENTER Vedose zone soil total porosity, n ^V (unitless)	ENTER Vadose zone soil water-filled porosity,
	s				1.88	0.375	0.054
MORE +	ENTER Terget risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT _C (yrs)	ENTER Averaging time for noncarcinogens, AT _{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	,
	1.0E-06	11	70	25	25	250	
	Used to calcula	ate risk-based	1				

groundwater concentration.

ABC Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w (cm²/s)	Henry's izw constant at reference temperature, H (atm-m ⁸ /mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point,	Normai boiling point, T _B (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oc} (cm³/g)	Pure component weter solubility, S (mg/L)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)
7.42E-02	1.05E-05	5.61E-03	25	6,895	330,55	523.00	3.16E+01	5.06E+03	0.0E+00	5.0E-01

INTERMEDIATE CALCULATIONS SHEET

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm²/cm²)	Vadose zone effective total fluid saturation, S _{is} (cm³/cm³)	Vadose zone soil intrinsic permeability, k _i (cm²)	Vadose zone soil relative air permeability, k _{rs} (cm²)	Vadose zone soil effective vapor permeability, k _v (cm²)	Thickness of capillary zone, L _{oz} (cm)	Total porosity in capillary zone, n _{ez} (cm³/cm³)	Air-filled porosity in capillary zone, $\theta_{n,cz}$ (cm³/cm³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm³/cm³)	Floor- wall seam perimeter, X _{crack} (cm)	
259	0.321	0.003	9.92E-08	0.998	9,90E-08	17.05	0.375	0.122	0.253	4,000	
Bidg. ventilation rate, Q _{bullatry} (cm³/s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total eree ratio, n (unitiess)	Crack depth below grade, Z _{crack} (cm)	Enthelipy of vaporization at ave. groundwater temperature, \(\Delta H_{\text{\chi_TS}} \) (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' _{T8} (unittess)	Vapor viscosity at ave. soil temperature, µтs (g/cm-s)	Vadose zone affective diffusion coefficient, D ^{ef} _V (cm²/s)	Capillary zone effective diffusion coefficient, D ^{eff} c (cm ² /s)	Total overall effective diffusion coefficient, D^{ef}_{-} (cm ² /a)	
1,69E+04	1.00E+06	4.00E-04	15	7,452	2.85E-03	1.23E-01	1.75E-04	1.20E-02	4.81E-04	4.66E-03]
Diffusion path length, L _d (cm)	Convection path length, L _p (cm)	Source vapor conc., C _{source} (µg/m ⁵)	Crack redius, r _{orack} (cm)	Average vapor flow rete into bidg., Q _{sol} (cm ³ /s)	Crack effective diffusion coefficient, D ^{crack} (cm²/s)	Area of crack, A _{crack} (cm²)	Exponent of equivalent foundation Peciet number, exp(Pe ¹) (unitiess)	Infinite source indoor attenuation coefficient, α (unitiess)	infinite source bldg. conc., C _{bulding} (μg/m³)	Unit risk factor, URF (µg/m³) ⁻¹	Reference conc., RfC (mg/m³)
259	15	1.23E+02	0.10	9.95E+01	1.20E-02	4.00E+02	1.24E+90	8.99E-04	1.10E-01	NA NA	5.0E-01

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

NA NA	6.61E+03	6.61E+03	5.06E+06	6.61E+03	NA NA	NA NA
indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncercinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitiess)	Hazerd quotient from vapor intrusion to indoor air, noncarcinogen (unitless)

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

DATA ENTRY SHEET

GW-SCREEN	CALCULATE BISK	ASED GROUNDY	ATER CONCEN	TRATION (enter "X" in "Y	(ES* boy)		
Version 3.0; 04/03	5, E55E 1, E 14611 2	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		TOTAL ON LOUIS NOT IN	LC Daty		
Version 5.0, 0400 ;		\r_6	V				
		YES	X				
Reset to			OR				
Defaults	CALCULATE INCRE	MENTAL RISKS F	ROM ACTUAL G	ROUNDWATER CONCE	NTRATION		
	(enter "X" in "YES" b						
•							
		YES					
		,		•			
	ENTER	ENTER					
		initial					
	Chemical	groundweter					
	CAS No.	conc.,					
	(numbers only,	Cw					
	no dashes)	(µg/L)		Chemical	=		
					7		
	75354		1,1-01	chloroethylene	j		
	ENTER	ENTER	ENTER	ENTER			
MORE	Depth			2177			
<u> </u>	below grade			Average		ENTER	
	to bottom	Depth		soil/		Average vapor	
	of enclosed	below grede	SCS	groundwater		low rate into bldg.	
	space floor,	to water table,	soil type	temperature,	(Les	ve blank to calcula	ris)
	LF	∟ w T	directly above	Tg		Q _{soff}	
	(cm)	(cm)	water table	(℃)		(i./m)	
	15	274	s 1	9.8	7 5		
			LI	8,0			
F							
MORE							
	ENTER		ENTER				
	Vadose zone		User-defined	ENTER	ENTER	ENTER	ENTER
	SCS		vandose zone	Vadose zone	Vadose zone	Vadose zone	Vadose zone
	soil type		soil vapor	SCS	soil dry	soil total	soil water-filled
	(used to estimate	OR	permeability,	soil type	bulk density,	porosity,	porosity,
	soil vapor		k,	Lookup Soli	Pb ^V	n ^v	6.,V
	permeability)		(cm²)	Parameters	(g/cm³)	(unitiess)	(cm³/cm³)
	permeablesy)		(011)		(groin)	(minees)	(out sour)
	8				1.68	0.376	0.054
:							
				**			
MORE							
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	
استخصا	Terget	Terget hezerd	Averaging	Averaging	ENIEK	ENIEK	
	risk for	quotient for	time for	time for	Exposure	Exposure	
		noncarcinogens,	carcinogens,	noncercinogens,	duration,	frequency,	
	cercinogens,					EF	
	TR	THQ	ATc	AT _{NC}	ED	Er	
			AT _C (yrs)	AT _{NC} (yrs)	ED (yrs)	(deys/yr)	
	TR (unitless)	THQ	(yrs)	(yrs)	(утв)	(deys/yr)	
	TR	THQ		AT _{NC} (yrs) 25			

groundwater concentration.

ABC Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w (cm²/s)	Henry's law constant at reference temperature, H (atm-m²/mol)	Henry's law constant reference temperature, T _R (°C)	Enthelpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (callmol)	Normal boiling point, T _B (°K)	Criticel temperature, T _C (°K)	Organic carbon partition coefficient, K _{oc} (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m²)
9.00E-02	1.04E-05	2.60E-02	25	6,247	304.75	576.05	5.89E+01	2.25E+03	0.0E+00	2.0E-01

INTERMEDIATE CALCULATIONS SHEET

Source- building separation,	Vadose zone soil air-filled porosity,	Vadose zone effective total fluid seturation,	Vadose zone soil intrinsic permeability,	Vadose zone soil relative air permeability,	Vadose zone soil effective vapor permeability,	Thickness of capillary zone,	Total porceity in capillary zone,	Air-filled porosity in capillary zone,	Water-filled porosity in capillary zone,	Floor- wall seam perimeter,	
Lt	e,v	S _{te}	k,	k _{ru}	k,	Læ	n _{ox}	$\theta_{a,cz}$	0 _{w,cz}	X _{crack}	
(cm)	(cm³/cm³)	(cm²/cm²)	(cm²)	(cm²)	(cm²)	(cm)	(cm³/cm³)	(cm³/cm³)	(cm³/cm³)	(cm)	
050	0.321	0.003	9.92E-08	0.998	9.90E-08	17.05	0.075	0.420	0,253	1 4 000	!
259	0.321	1 0.003 1	8.8ZE-06	0.396	9.905-06	17.00	0.375	0.122	0.233	4,000	ľ
Bidg. ventilation rate, Obustang	Area of enclosed space below grade, A _B	Cnack- to-total area ratio,	Crack depth below grade, Z _{onck}	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,78}$	Henry's law constant at ave. groundwater temperature, HTs	Herry's law constant at ave. groundwater temperature, H'18	Vapor viscosity at ave. soil temperature, µ18	Vadose zone effective diffusion coefficient, Derv	Capillary zone effective diffusion coefficient, D ^{eff}	Total overall effective diffusion coefficient,	
(cm³/s)	(cm²)	(unitless)	(cm)	(cel/mol)	(atm-m³/mol)	(unitiess)	(g/cm-s)	(cm²/s)	(cm²/s)	(cm²/s)	•
1.69E+04	1.00E+06	4.00E-04	15	6,394	1.46E-02	6.28E-01	1.75E-04	1.45E-02	5.78E-04	5.61E-03	
Diffusion path length,	Convection path length,	Source vapor conc.,	Crack radius,	Average vapor flow rate into bldg.,	Crack effective diffusion coefficient,	Area of crack,	Exponent of equivalent foundation Peclet number,	Infinite source indoor attenuation coefficient,	Infinite source bldg. conc.,	Unit risk factor,	Reference
La	Ļ _p	Caonice	r _{creck}	Q _{sol}	Danak	Acreak	exp(Pe')	α	Coulding	URF	RfC
(cm)	(cm)	(µg/m³)	(cm)	(cm³/s)	(cm²/s)	(cm²)	(unitless)	(unitiess)	(μg/m³)	(μg/m³) ⁻¹	(mg/m³)
259	15	6.28E+02	0.10	9.95E+01	1.45E-02	4.00E+02	1.89E+74	1.05E-03	6.60E-01] NA	2.0E-01

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	indoor exposure groundweter conc, noncerdinagen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/i_)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncercinogen (unitless)
NA NA	4.43E+02	4.43E+02	2.25E+06	4.43E+02	NA	NA NA

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

			DATAENTRY	SHEET									
GW-SCREEN	CALCULATE RISK-E	CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)											
Version 3.0; 04/03		YES	X OR										
Defaults	CALCULATE INCRE (enter "X" in "YES" b		ROM ACTUAL G	ROUNDWATER CONCE W)	NTRATION								
		YES											
	ENTER	ENTER Initial											
	Chemical CAS No.	conc.,											
	(numbers only, no dashes)												
	71568		1,1,1-7	richloroethane	i								
MORE	ENTER Depth	ENTER	ENTER	ENTER									
	below grade to bottom	Depth		Average soil/		ENTER Average vapor							
	of enclosed	below grade	SCS	groundwater		ow rate into bldg.							
	space floor,	to water table,	soil type	temperature,	(Lee	ve blank to calcular	te)						
	Ļ	<u>r</u> ₩4	directly above	Ts		Q _{ed}							
	(cm)	(cm)	water table	(℃)		(<u>L/m)</u>							
	15	274	s	9.8	ז ר								
			·		·	,							
MORE													
اسمحنصما	ENTER		ENTER										
	Vadose zone		User-defined	ENTER	ENTER	ENTER	ENTER						
	SCS		vandose zone	Vadose zone	Vedose zone	Vadose zone	Vedose zone						
·	soil type (used to estimate	OR	soil vapor permeability.	SCS soil type	soil dry bulk density,	soil total porosity,	soil water-filled porosity,						
	soil vapor	0.1	K,	Lookup Solf	Pb.	n ^V	θ _ω V						
	permeebility)		(cm²)	Paremeters	(g/cm ⁸)		(cm³/cm³)						
	partitionality	ı			Cg/OIII)	(unitless)	(on vary						
	S				1.88	0.375	0.054						
					· 								
MORE	ENTER	ENTER	EMPP	ماد المستمر بر مو		7-45-1m on.							
L	ENIEK Target	Target hazerd	ENTER	ENTER	ENTER	ENTER							
	risk for	quotient for	Averaging time for	Averaging time for	Exposure	Exposure							
	carcinogens,	noncarcinogens,	carcinogens,	noncercinogens,	duration,	frequency,							
	TR	THQ	AT _C	ATNC	ED	EF							
	(unitless)	(unitiess)	(yrs)	(yrs)	(yrs)	(deys/yr)							
	1.0E-06	1	70	25	25	250							
			1										
	Used to calcula	nte risk-based	1										

groundwater concentration.

ABC Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w (cm²/s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R	Enthalpy of vaporization at the normal boiling point, \$\Delta H_{V,b}\$ (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oe} (cm ⁸ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)
7.80E-02	8.80E-06	1.72E-02	25	7,136	347.24	545.00	1.10E+02	1.33E+03	0.0E+00	2.2E+00
END										

INTERMEDIATE CALCULATIONS SHEET

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, θ_n^V (cm³/cm³)	Vadose zone effective total fluid saturation, S _b (cm³/cm³)	Vadose zone soil intrinsic permeability, k _i (cm²)	Vadose zone soil relative air permeability, k _{ra} (cm²)	Vadose zone soil effective vapor permeability, k _v (cm²)	Thickness of capillary zone, L _{oz} (cm)	Total porosity in capillary zone, n _{cz} (cm³/cm³)	Air-filed porosity in capillary zone, e _{a.cz} (cm ³ /cm ³)	Water-filled porosity in capillary zone, 6 _{w,cz} (cm³/cm³)	Floor- wall seam perimeter, X _{creak} (cm)	
259	0.321	0.003	9.92E-08	0.998	9.90E-08	17.05	0.375	0.122	0.253	4,000	
Bidg. ventiletion rate, C _{building} (cm³/s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, n (unitiess)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at axe, groundwater temperature, \(\Delta \text{L}\ru_{\text{TS}} \) (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soli temperature, µss (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} v (cm²/s)	Capillary zone effective diffusion coefficient, D ^{eff} (cm²/s)	Total cversil effective diffusion coefficient, D ^{eff} (cm²/s)	
1.69E+04	1.00E+06	4.00E-04	15	7,887	8.39E-03	3.61E-01	1.75E-04	1.26E-02	5.01E-04	4.87E-03	1
Diffusion peth length, L _d (cm)	Convection path length, L _p (cm)	Source vapor conc., C _{source} (µg/m³)	Crack radius, r _{omot} (om)	Average vapor flow rate into bldg., Q _{sot} (cm ³ /s)	Crack effective diffusion coefficient, D ^{crack} (cm ² /s)	Area of crack, A _{crack} (cm²)	Exponent of equivalent foundation Peclet number, exp(Pet) (unitless)	Infinite source indoor attenuation coefficient, α (unitiess)	infinite source bldg, conc., C _{bulkleg} (μg/m³)	Unit risk factor, URF (µg/m³) ⁻¹	Reference conc., RfC (mg/m³)
259	15	3.61E+02	0.10	9.95E+01	1.26E-02	4.00E+02	5.05E+85	9,33E-04	3.37E-01	l NA	2.2E+00

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

indoor exposure groundwater conc., carcinogen (µg/L)	indoor exposure groundweter conc., noncarcinogen (µg/L)	Risk-based Indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundweter conc., (µg/L)	incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA NA	9,52E+03	9.52E+03	1.33E+06	9.52E+03	NA NA	NA NA

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

DATA ENTRY SHEET

W-SCREEN sion 3.0; 04/03	CALCULATE RISK-B	ASED GROUNDW	ATER CONCENT	RATION (enter "X" in "Y	ES" book)		
		YES [X				
Reset to Defaults	CALCULATE INCRE	MENTAL RISKS FI	OR ROM ACTUAL GR	ROUNDWATER CONCE	NTRATION		
·	(enter "X" in "YES" bo	ox and initial ground	twater conc. below	v)			
	•	YES [
	ENTER	ENTER Initial					
	Chemical	groundwater					
	CAS No.	conc.,					
	(numbers only,	C _W					
	no deshes)	(μg/L)	c	hamical	:		
	156592		cis-1,2-D	ichloroethylene	l		
·	ENTER	ENTER	ENTER	ENTER			
MORE	Depth			A		ENTER	
<u></u>	below grade to bottom	Depth		Average soll/		Avenage vapor	
	of enclosed	eberg woled	SCS	groundwater		flow rate into bidg.	
	space floor,	to water table.	soil type	temperature,		ave blank to calculate	a)
	L _F	Lwr	directly above	Ta	,	Q _{sol}	-,
	(cm)	(CRI)	water table	(°C)		(L/m)	
							
	15	274	S T	9.8	3 1		
					•		
MORE							
	ENTER		ENTER				
	Vedose zone		User-defined	ENTER	ENTER	ENTER	ENTER
	scs		vandose zone	Vadose zone	Vadose zone	Vadose zone	Vedose zone
	soil type	OR	soli vapor	SCS	soil dry	soil total	soil water-filled
	(used to estimate	OR	permeability,	soil type	bulk density,	porosity, n ^v	porosity,
	soil vapor		K _v	Lockup Soll Parameters	PbV .		6.V
	permeability)	i	(cm²)		(g/cm³)	(unitless)	(cm³/cm³)
	8				1.66	0.375	0.054
					1.60	0.575	0.554
MORE							
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	
	Target	Target hazard	Averaging	Averaging			
	risk for	quotient for	time for	time for	Exposure	Exposure	
	carcinogens,	noncarcinogens,	cercinogens,	noncarcinogens,	duration,	frequency,	
	TR	THQ	AT _C	AT _{NC}	ED	EF	
	(unitiess)	(unitless)	(yrs)	(yrs)	(yrs)	(days/yr)	
	1.0E-08	1		25	25	250	
	Used to calcula	te risk-based					

groundwater concentration.

ABC Diffusivity in air, D _a (cm²/a)	Diffusivity in water, D _w (cm²/s)	Henry's law constant at reference temperature, H (etm-m³/mol)	Henry's lew constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boffing point, \$\Delta H_{v,b}\$ (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oc} (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)
7.38E-02	1.13E-05	4.07E-03	25	7,192	333.65	544.00	3.55E+01	3.50E+03	0.0E+00	3.5E-02

INTERMEDIATE CALCULATIONS SHEET

Source- building separation, L ₇ (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm³/cm³)	Vadose zone effective total fluid saturation, S _b (cm³/cm³)	Vadose zone soil intrinsic permeability, k, (cm²)	Vadose zone soil relative air permeability, k _{rg} (cm²)	Vadose zone soil effective vapor permeability, k _v (cm²)	Thickness of capillary zone, L _{cx} (cm)	Total porosity in capillary zone, n _{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm³/cm³)	Water-filled porosity in capillary zone, θ _{w,rz} (cm ³ /cm ³)	Floor- wall searn perimeter, X _{crest} (cm)	
259	0.321	0.003	9.92E-08	0.998	9.90E-08	17.05	0.375	0.122	0.253	4,000	
Bidg. ventilstion rate, Q _{building}	Area of enclosed space below grade, A _B	Crack- to-total area ratio, η	Crack depth below grade, Z _{crack}	Enthalpy of vaporization at ave. groundwater temperature, ΔΗ _{ν,τs}	Henry's law constant at ave. groundwater temperature, H _{TS}	Henry's law constant at ave. groundwater temperature, H' _{T8}	Vapor viscosity at ave. soil temperature,	Vadose zone effective diffusion coefficient, D ^{eff} v	Capiliary zone effective diffusion coefficient, D ^{eff} az	Total overall effective diffusion coefficient, D ^{eff} T	
(cm³/s)	(cm²)	(unitless)	(cm)	(cal/mol)	(atm-m³/mol)	(unitiess)	(g/cm-s)	(cm²/s)	(cm²/s)	(cm²/s)	•
1.69E+04	1.00E+06	4.00E-04	15	7,736	2.02E-03	8.69E-02	1.75E-04	1.19E-02	4.81E-04	4.64E-03	}
Diffusion path length, L _d (cm)	Convection path length, L _p (cm)	Source vapor conc., C _{source} (µg/m³)	Crack radius, ^r crad (cm)	Average vapor flow rate into bldg., Q _{sol} (cm ³ /s)	Crack effective diffusion coefficient, D ^{crack} (cm ² /s)	Area of crack, A _{crack} (cm ²)	Exponent of equivalent foundation Peclet number, exp(Pe ^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bidg. conc., C _{bulding} (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)
259	15	8.69E+01	0.10	9,95E+01	1.19E-02	4.00E+02	6.70E+90	8.97E-04	7.79E-02	NA NA	3.5E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundweter conc., cercinogen (µg/L)	indoor exposure groundweiter conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final Indoor exposure groundwater conc., (µg/L)	Incremental risk from vepor intrusion to indoor air, carcinogen (unitiess)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA NA	6.56E+02	6.56E+02	3.50E+06	6.56E+02	NA	NA NA

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Coource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

DATA ENTRY SHEET

				-, ,								
W-SCREEN	CALCULATE RISK-R	ASED GROUNDW	ATER CONCEN	TRATION (enter "X" in "YE	S' box)							
rsion 3.0; 04/03												
		YES	Х									
Reset to		•	OR									
Defaults	CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION											
	(enter "X" in "YES" be											
		YES										
	ENTER	ENTER										
	ENIEK	initial										
	Chemical	groundwater										
•	CAS No.	conc.,										
	(numbers only,	(mb/r) C ^M		Ob!!								
	no dashes)	(44)(2)	······································	Chemicel								
i	127184		Tetrac	chloroethylene	ı							
•												
	ENTER	ENTER	ENTER	ENTER								
MORE	Depth below grade			Average		ENTER						
<u> </u>	to bottom	Depth		soil/		Average vapor						
	of enclosed	below grade	SCS	groundwater		flow rate into bidg.						
	space floor,	to water table,	soil type	temperature,	(Les	eve blank to calculat	(e)					
	i.e	Lwr	directly above	T _{\$} (℃)		Q _{eal}						
	(CEII)	(cm)	water table	(0)		(L/m)						
	15	274	8	9.8								
					•							
MORE												
L	ENTER		ENTER									
	Vadose zone		User-defined	ENTER	ENTER	ENTER	ENTER					
	scs		vendose zone	Vadose zone	Vadose zone	Vadose zone	Vadose zone					
	soil type (used to estimate	or	soil vapor permeability,	SCS soll type	soil dry bulk density,	soil total porosity,	soil water-filled porosity,					
	soli vapor	O.C	K _v	Lookup Soli	Ps V	nv	$\theta_{\mathbf{w}}^{\mathbf{V}}$					
	permeability)		(cm²)	Parameters	(g/cm ⁶)	(unitless)	(cm³/cm³)					
	88				1.68	0.375	0.054					
MORE	ENTER	ENTER	ramen			dr. continu						
<u> </u>	Target	Target hezerd	ENTER Avereging	ENTER Averaging	ENTER	ENTER						
	risk for	quotient for	time for	time for	Exposure	Exposure						
	carcinogens,	noncercinogens,	carcinogens,	noncercinogens,	duration,	frequency,						
	TR	THQ	AT _C	AT _{NC}	ED	EF						
	(unitless)	(unitless)	(yrs)	(yre)	(yrs)	(days/yr)						
	1.0E-06	1	70	25	25	250						
	Ligari to calcula	المستحددة المستحددة										
		4164 I DANK-TU-DU-NY										

groundwater concentration.

ABC Diffusivity in eir, D _a (cm²/s)	Diffusivity in water, D _w (cm²/s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthelpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (callmoi)	Normal boiling point, T _B (°K)	Critical temperature, T _C (⁶ K)	Organic carbon partition coefficient, Koc (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)	
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	3.0E-06	0.0E+00	ļ

INTERMEDIATE CALCULATIONS SHEET

Source- building separation, L _T (cm)	Vadose zone soil air-filed porosity, θ _a ^V (cm³/cm³)	Vadose zone effective total fluid saturation, S _{te} (cm ³ /cm ³)	Vadose zone soil intrinstc permeability, k _i (cm²)	Vadose zone soil relative air permeability, k _{ra} (cm²)	Vadosa zone soil effective vapor permeability, k _v (cm²)	Thickness of captillary zone, L _{cz} (cm)	Total porosity in capillary zone, n _{ez} (cm³/cm³)	Air-filled porosity in capillary zone, θ _{a,cz} (cm ⁸ /cm ²)	Weter-filled porosity in capillary zone, 9 _{w,cz} (cm³/cm³)	Floor- wail seam perimeter, X _{crack} (cm)	
259	0.321	0.003	9.92E-08	0.998	9.90E-08	17.05	0.375	0.122	0.253	4,000	
Bidg. veritiation rate, Q _{bulding} (cm²/s)	Area of enclosed space below grade, A _B (cm ²)	Creack- to-total area ratio, n (unitiess)	Crack depth below grade, Z _{onet} (cm)	Enthalpy of vaporization at ave. groundwater temperature, \(\Delta H_{\cup,\text{TB}}\) (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' ₁₈ (unitiess)	Vapor viscosity at ave. soil temperature, µrs (g/cm-a)	Vadose zone effective diffusion coefficient, D ^{eff} v (cm²/s)	Capillary zone effective diffusion coefficient, D*** (cm²/s)	Total overall effective diffusion coefficient, D ^{eff} (cm²/s)	
1.69E+04	1.00E+06	4.00E-04	15	9,555	7.72E-03	3.32E-01	1.75E-04	1.16E-02	4.63E-04	4.50E-03	
Diffusion path length, L _d (cm)	Convection path length, L _p (cm)	Source vapor conc., C _{source} (µg/m³)	Crack radius, r _{orack} (cm)	Average vapor flow rate into bldg., Q _{ant} (cm ⁸ /s)	Crack effective diffusion coefficient, D ^{orack} (cm ² /s)	Area of crack, A _{crack} (cm ²)	Exponent of equivalent foundation Peclet number, exp(Pe ⁵) (unitless)	Infinite source indoor attenuation coefficient, c. (unitiess)	Infinite source bidg. conc., C _{bulking} (μg/m³)	Unit risk factor, URF (μg/m³) ⁻¹	Reference conc., RfC (mg/m³)
259	15	3.32E+02	0.10	9.95E+01	1.16E-02	4.00E+02	7.00E+92	8.72E-04	2.90E-01	3.0E-06	NA NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

indoor exposure groundwater conc., cardinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/l.)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component weter solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitiese)
4.70E+00) NA	4.70E+00	2.00E+05	4.70E+00	. NA	l NA
	 			11102100		

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

DATA ENTRY SHEET

			DAIAENIKI	SMEET			
GW-SCREEN Version 3.0; 04/03	CALCULATE RISK-B	ASED GROUNDW YES		FRATION (enter "X" in "YI	ES" box)		
Reset to		TES	<u>×</u>				
Defaults	CALCULATE INCRE (enter "X" in "YES" b			ROUNDWATER CONCER	NTRATION		
		YES					
	ENTER Chemical	ENTER Initial groundwater					
	CAS No.	conc.,					
	(numbers only,	C _W		Nh amata at			
	no dashes)	(μg/L)	(Chemical			
	79016		Trich	ioroethylene			
MORE	ENTER Depth	ENTER	ENTER	ENTER			
	below grade , to bottom	Depth		Average soil/		ENTER Average vapor	
	of enclosed	below grade	SCS	groundwater	1	Now rate into bldg.	
	space floor,	to water table,	soil type	temperature,		we blank to calcula	te)
	ię.	LWT	directly above	T _S		Q _{eol}	
	(cm)	(cm)	water table	(°C)		(L/m)	
	15	274	S	9.8	, ,		
	<u> </u>	<u> </u>		8.0	ı .		
MORE							
	ENTER		ENTER				
	Vadose zone		User-defined	ENTER	ENTER	ENTER	ENTER
•	SCS soil type		vandose zone soil vapor	Vadose zone SCS	Vadose zone soil dry	Vadose zone soii total	Vadose zone soil water-filled
	(used to estimate	OR	permeability,	soil type	bulk density,	porosity,	porosity,
	soil vapor		k,	Lookup Soli	PbV	'n	θ,,∨
	permeability)		(cm²)	Parameters	(g/cm³)	(unitless)_	(cm³/cm³)
	8				1.86	0,375	0.054
MORE							
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	
	Target	Target hazard	Averaging	Averaging			
	risk for cercinogens,	quotient for noncarcinogens,	time for	time for	Exposure	Exposure	
	TR	THQ	carcinogens, AT _C	noncercinogens, AT _{NC}	dur etion, ED	frequency, EF	
	(aselfinu)	(unitless)	(yrs)	(yrs)	(yrs)	(days/yr)	
	1.0E-08	1	70	25	25	250	
	Used to calcula	te risk-besed					

groundwater concentration.

ABC Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w (cm²/s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, \$\Delta H_{V,b}\$ (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oc} (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³) ⁻¹	Reference conc., RfC (mg/m³)
7.80E-02	8.80E-06	1.72E-02	25	7,136	347.24	545.00	1.10E+02	1.33E+03	0.0E+00	2.2E+00

INTERMEDIATE CALCULATIONS SHEET

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, θ _a ^V (cm³/cm³)	Vadose zone effective total fluid saturation, S _{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k, (cm²)	Vadose zone soil relative air permeability, k _{ra} (cm²)	Vadose zone soil effective vapor permeability, k _v (cm²)	Thickness of capillary zone, L _{cz} (cm)	Total porosity in capillary zone, n _{cz} (cm³/cm³)	Air-filled porosity in capillary zone, θ _{a,cz} (cm³/cm³)	Water-filled porosity in capillary zone, θ _{w,cz} (cm³/cm³)	Floor- wall seam perimeter, X _{orack} (cm)	
259	0.321	0.003	9.92E-08	0.998	9.90E-08	17.05	0.375	0.122	0.253	4,000	İ
Bldg. ventikation rate, Q _{building} (cm ³ /s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, ΔH _{v,TS} (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m ² /mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, µтs (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} v (cm²/s)	Capillary zone effective diffusion coefficient, D ^{eff} _{cz} (cm ² /s)	Total overall effective diffusion coefficient, Deff (cm²/s)	
1.69E+04	1.00E+06	4.00E-04	15	7,887	8.39E-03	3.61E-01	1.75E-04	1.26E-02	5.01E-04	4.87E-03	ł
Diffusion path length, L _d (cm)	Convection path length, L _p (cm)	Source vapor conc., C _{source} (µg/m³)	Crack radius, r _{orack} (cm)	Average vapor flow rate into bldg., Q _{soil} (cm ³ /s)	Crack effective diffusion coefficient, D ^{orack} (cm ² /s)	Area of crack, A _{crack} (cm ²)	Exponent of equivalent foundation Peclet number, exp(Pe ^f) (unitiess)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg, conc., C _{building} (µg/m³)	Unit risk factor, URF (μg/m³) ¹	Reference conc., RfC (mg/m³)
259	15	3.61E+02	0.10	9.95E+01	1.26E-02	4.00E+02	5.05E+85	9.33E-04	3.37E-01	NA NA	2.2E+00

Results	SHEET
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RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA NA	9.52E+03	9.52E+03	1.33E+06	9.52E+03	NA	NA .

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

			DATA ENTRY S	SHEET			
GW-SCREEN	CALCULATE RISK-B	ASED GROUNDV	VATER CONCENT	RATION (enter "X" in "\	ES" box)		
		YES	X OR				
Defaults			ROM ACTUAL GR		NTRATION		
		YES					
	ENTER	ENTER Initial					
	Chemical	groundwater					
Version 3.0; 04/03 Reset to Defaults CALCULATE INCREMENTAL R (enter "X" in "YES" box and initial linitial Chemical groundw: CAS No. conc. (numbers only, no dashes) (µg/L 156592 ENTER ENTER ENTE Depth below grade to bottom Deptt of enclosed below grace floor, to water to Le Lwr (cm) (cm)			_	hemical			
	110 dasiles/	(P8/C)		Memicai	=		
	156592		cis-1.2-F	Dichloroethylene	7		
	1				4		
	ENTER	ENTER	ENTER	ENTER			
				Average		ENTER	
			scs	soil/		Average vapor low rate into bldg.	
		to water table.	soil type	groundwater temperature,		iow rate into blog. ive blank to calcula	te)
		•	directly above	T _S	(100	Q _{eol}	,
			water table	(°C)		(L/m)	
	10/11/		Water Idea		-	10000	
	15	274	S	9.8	7 1		
	h						
\ <u></u>	ENTER		ENTER				
			User-defined	ENTER	ENTER	ENTER	ENTER
			vandose zone	Vadose zone	Vadose zone	Vadose zone	Vadose zo
		25	soil vapor	SCS	soil dry	soil total	soil water-fi
	1 '	OR	permeability,	soil type	bulk density,	porosity, n ^v	porosity,
	soil vapor		k _v	(Lookup Soll) Parameters	Pb ^V	n°	θ,,,
	permeability)		(cm²)	,	(g/cm³)	(unitless)	(cm³/cm ³
	 				7 4 66	0.276	0.054
	L				1.66	0.375	0.054

MORE ↓	ENTER Target risk for carcinogens, TR (unitless)	ENTER Terget hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT _C (yrs)	ENTER Averaging time for noncarcinogens, AT _{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
	1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R	Enthalpy of vaporization at the normal boiling point,	Normal boiling point, T _B (°K)	Critical temperature, T _C	Organic carbon partition coefficient, K _{sc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)
7.36E-02	1.13E-05	4.07E-03	25	7,192	333.65	544.00	3.55E+01	3.50E+03	0.0E+00	3.5E-02

INTERMEDIATE CALCULATIONS SHEET

Source- building separation, L ₇ (cm)	Vadose zone soil air-filled porosity, e _a v (cm³/cm³)	Vadose zone effective total fluid saturation, S _{le} (cm³/cm³)	Vadose zone soil intrinsic permeability, k _i (cm²)	Vadose zone soil relative air permeability, k _{rg} (cm²)	Vadose zone soil effective vapor permeability, k _v (cm²)	Thickness of capillary zone, L _{cz} (cm)	Total porosity in capillary zone, n _{cz} (cm³/cm³)	Air-filled porosity in capillary zone, θ _{a,cz} (cm³/cm³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm³/cm³)	Floor- wall seam perimeter, X _{crack} (cm)	
259	0.321	0.003	9.92E-08	0.998	9.90E-08	17.05	0.375	0.122	0.253	4,000	
Bldg. ventilation rate, Q _{building} (cm³/s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, ΔΗ _{ν,τs} (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature,	Vadose zone effective diffusion coefficient, D ^{eff} v (cm²/s)	Capillary zone effective diffusion coefficient, D ^{eff} (cm²/s)	Total overall effective diffusion coefficient, D ^{off} _T (cm ² /s)	
1.69E+04	1.00E+06	4.00E-04	15	7,736	2.02E-03	8.69E-02	1.75E-04	1.19E-02	4.81E-04	4.64E-03	
Diffusion path length, L _d (cm)	Convection path length, L _p (cm)	Source vapor conc., C _{source} (μg/m³)	Crack radius, r _{crack} (cm)	Average vapor flow rate into bldg., Q _{soli} (cm ³ /s)	Crack effective diffusion coefficient, D ^{crack} (cm ² /s)	Area of crack, A _{crack} (cm ²)	Exponent of equivalent foundation Peclet number, exp(Pe ^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., C _{building} (µg/m³)	Unit risk factor, URF (μg/m³)-1	Reference conc., RfC (mg/m³)
259	15	8.69E+01	0.10	9.95E+01	1.19E-02	4.00E+02	6.70E+90	8.97E-04	7.79E-02	T NA	3.5E-02

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA .	6.56E+02	6.56E+02	3.50E+06	6.56E+02	NA	NA NA

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

DATA ENTRY SHEET

GW-SCREEN Version 3.0; 04/03	CALCULATE RISK-E	BASED GROUNDW	ATER CONCENT	TRATION (enter "X" in "Y	'ES" box)		
		YES	×				
Reset to Defaults			OR				
1)	CALCULATE INCRE (enter "X" in "YES" b			ROUNDWATER CONCE w)	NTRATION		
		YES					
	ENTER	ENTER					
	Chemical	Initial groundwater					
•	CAS No.	conc.,					
	(numbers only,	Cw					
	no dashes)	(µg/L)		Shemical	•		
	127184		Tetrac	hloroethylene]		
MORE	ENTER Depth	ENTER	ENTER	ENTER			
—	below grade			Average		ENTER	
	to bottom	Depth		soil/	_	Average vapor	
	of enclosed space floor,	below grade to water table,	SCS soil type	groundwater temperature,		ow rate into bldg. ve blank to calcula	te\
	L _F	L _{W1}	directly above	T _S	(1.00)	Q _{soil}	,
	(cm)	(cm)	water table	(°C)	_	(L/m)	
	15	274	s	9.8	. L		
MORE	.		············				
	ENTER Vadose zone		ENTER User-defined	ENTER	ENTER	ENTER	ENTER
	SCS		vandose zone	Vadose zone	Vadose zone	Vadose zone	Vadose zone
	soil type		soil vapor	SCS	soil dry	soil total	soil water-filled
	(used to estimate	OR	permeability,	soil type	bulk density,	porosity,	porosity,
	soil vapor		k _v (cm²)	Lookup Soli Parameters	ρ _b ^V	n ^V	θ _w V (cm³/cm³)
	permeability)	:	(0,111)		(g/cm ³)	(unitless)	(Giti /Giti)
	S				1.66	0,375	0.054
MORE							
L	ENTER Target	ENTER Target hazard	ENTER	ENTER	ENTER	ENTER	
	risk for	quotient for	Averaging time for	Averaging time for	Exposure	Exposure	
	carcinogens,	noncarcinogens,	carcinogens,	noncercinogens,	duration,	frequency,	
	TR	THQ	ATc	AT _{NC}	ED	EF	
	(unitless)	(unitless)	(yrs)	(yrs)	(yrs)	(days/yr)	
	1.0E-06	11	70	25	25	250	
	Used to calcula	ate risk-based					

groundwater concentration.

CHEMICAL PROPERTIES SHEET

ABC Diffusivity in air, Da (cm²/s)	Diffusivity in water, D _w (cm²/s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R	Enthalpy of vaporization at the normal boiling point, \$\Delta H_{v,b}\$ (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)
7.20E-02	8.20E-06	1,84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	3.0E-06	0.0E+00
END										

INTERMEDIATE CALCULATIONS SHEET

Source- building separation, L _T (cm)	Vadose zone soil air-filed porosity, θ _a ^V (cm³/cm³)	Vadose zone effective total fluid saturation, S _{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k _i (cm²)	Vadose zone soil relative air permeability, k _{rg} (cm²)	Vadose zone soil effective vapor permeability, k _v (cm²)	Thickness of capillary zone, L _{cz} (cm)	Total porosity in capillary zone, n _{cz} (cm³/cm³)	Air-filled porosity in capillary zone, e _{a.cz} (cm³/cm³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm³/cm³)	Floor- wall seam perimeter, X _{crack} (cm)	
259	0.321	0.003	9.92E-08	0.998	9.90E-08	17.05	0.375	0.122	0.253	4,000	
Bldg. ventilætion rate, Q _{bullding} (cm³/s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, ΔΗ _{ν,TS} (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature,	Vadose zone effective diffusion coefficient, D ^{eff} v (cm ² /s)	Capillary zone effective diffusion coefficient, D ^{eff} _{c2} (cm ² /s)	Total overall effective diffusion coefficient, Deff (cm²/s)	
1.69E+04	1.00E+06	4.00E-04	15	9,555	7.72E-03	3.32E-01	1.75E-04	1.16E-02	4.63E-04	4.50E-03	
Diffusion path length, L _d (cm)	Convection path length, L _p (cm)	Source vapor conc., C _{source} (µg/m³)	Crack radius, r _{orack} (cm)	Average vapor flow rete into bldg., Q _{soil} (cm ³ /s)	Crack effective diffusion coefficient, D ^{orack} (cm ² /s)	Area of crack, A _{crack} (cm ²)	Exponent of equivalent foundation Peclet number, exp(Pe ^f) (unitless)	Infinite source indoor attenuation coefficient, c (unitless)	Infinite source bldg. conc., C _{building} (μg/m³)	Unit risk factor, URF (μg/m³) ⁻¹	Reference conc., RfC (mg/m³)
259	15	3.32E+02	0.10	9.95E+01	1.16E-02	4.00E+02	7.00E+92	8.72E-04	2.90E-01	3.0E-06	NA

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RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	ricemental risk from vapor intrusion to indoor air, carcinogen (unitless)	riezard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.70E+00	NA NA	4.70E+00	2.00E+05	4.70E+00	NA NA	NA]

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Csource and Clouiding on the INTERCALCS worksheet are based on unity and do not represent actual values.

			DATA ENTRY	SHEET			
Course I							
GW-SCREEN	CALCULATE RISK-B	IASED GROUNDW	VATER CONCENT	" ni "X" retne) NOITAR	(ES. DOX)		
Version 3.0; 04/03		(
		YES	X				
Reset to			OR				
Defaults	CALCULATE INCRE	MENTAL RISKS F	ROM ACTUAL GI	ROUNDWATER CONCE	NTRATION		
	(enter "X" in "YES" be	ox and initial groun	idwater conc. belo	w)			
		YES	L				
	ENTER	ENTER					
	Chemical	Initial groundwater					
	CAS No.	conc.,					
	(numbers only,	G _W					
	no dashes)	(μ g /L)	c	Chemical			
					-		
	79016	 	Trich	loroethylene	1		
					_		
	ENTER	ENTER	ENTER	ENTER			
MORE	Depth						
<u> </u>	below grade	D		Average soil/		ENTER	
	to bottom of enclosed	Depth below grade	SCS	son/ groundwater	f	Average vapor low rate into bldg	
	space floor,	to water table,	soil type	temperature,		ve blank to calcu	
	L _F	Lwt	directly above	Ts	,-	Q _{eof}	•
	(cm)	(cm)	water table	(℃)		(L/m)	_
							_
	15	274	s	9.8] []
MORE							
····							
	ENTER		ENTER				
	Vadose zone		User-defined	ENTER	ENTER	ENTER	ENTER
	scs		vandose zone	Vadose zone	Vadose zone	Vadose zone	Vadose zona
	soil type (used to estimate	OR	soil vapor	SCS	soil dry	soil total	soil water-filled
	1 '	OR	permeability,	soil type	bulk density, v	porosity, n ^v	porosity, θ _w ∨
	soil vapor		k _v (cm²)	Lookup Soli Parameters	ρ _b ν		
	permeability)		(cm.)		(g/cm³)	(unitless)	(cm³/cm³)
		,			1.86	0,375	0.054
					1 1.00 1	0.570	0.007
[-1222- -1							
MORE	ENTER	ENTER	ENTER	Parters.	rarro.	rurrn	
<u> </u>	Target	Target hazard	ENTER Averaging	ENTER Averaging	ENTER	ENTER	
	risk for	quotient for	time for	time for	Exposure	Exposure	
	carcinogens,	noncarcinogens,	carcinogens,	noncarcinogens,	duration,	frequency,	
	TR	THQ	ATc	AT _{NG}	ED	EF	
	(unitless)	(unitless)	(yrs)	(yrs)	(yrs)	(days/yr)	
	(Unitiess)	(unidead)	(y10/	(712)	(915)	\dayo/yi/	_

Used to calculate risk-based groundwater concentration.

CHEMICAL PROPERTIES SHEET

ABC Diffusivity in air, Da	Diffusivity in water, D _w	Henry's law constant at reference temperature, H	Henry's law constant reference temperature,	Enthalpy of vaporization at the normal boiling point, ΔH _{vb}	Normal boiling point, T _B	Critical temperature,	Organic carbon partition coefficient, Kac	Pure component water solubility, S	Unit risk factor, URF	Reference conc., RfC
_		_	1R	21 ty,b	_	1 C	2-			
(cm²/s)	(cm²/s)	(atm-m³/mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm³/g)	(mg/L)	(μ g/m³) ⁻¹	(mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.47E+03	1.1E-04	4.0E-02

INTERMEDIATE CALCULATIONS SHEET

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, θ _a ^V (cm³/cm³)	Vadose zone effective total fluid saturation, S _{le} (cm³/cm³)	Vadose zone soil intrinsic permeability, k _i (cm²)	Vadose zone soil relative air permeability, k _m (cm²)	Vadose zone soil effective vapor permeability, k _v (cm²)	Thickness of capillary zone, L _{oz} (cm)	Total porosity in capillary zone, n _{cz} (cm³/cm³)	Air-filled porosity in capillary zone, θ _{a,⊄} (cm³/cm³)	Water-filled porosity in capillary zone, θ _{w,cz} (cm³/cm³)	Floor- wall seam perimeter, X _{orack} (cm)	
259	0.321	0.003	9.92E-08	0.998	9.90E-08	17.05	0.375	0.122	0.253	4,000	Ĭ
Bidg. ventilation rate, Q _{buldang} (cm ³ /s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, \[\Delta H_{\cup,\text{TS}} \] (cal/mol)	Henry's law constant at ave. groundwater temperature, Hrs (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, µтs (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} v (cm²/s)	Capillary zone effective diffusion coefficient, D ^{eff} (cm ² /s)	Total overall effective diffusion coefficient, D ^{eff} (cm ² /s)	
1.69E+04	1.00E+06	4.00E-04	15	8,559	4.73E-03	2.04E-01	1.75E-04	1.28E-02	5.09E-04	4.94E-03]
Diffusion path length,	Convection path length,	vapor conc., C _{source}	Crack radius, r _{crack}	Average vapor flow rate into bldg., Q _{soil}	Crack effective diffusion coefficient, D ^{crack}	Area of crack, Acrack	Exponent of equivalent foundation Peclet number, exp(Pe ¹)	Infinite source indoor attenuation coefficient,	infinite source bldg. conc., Chuiding	Unit risk factor, URF	Reference conc., RfC
(cm)	(cm)	(μ g/m³)	(cm)	(cm³/s)	(cm²/s)	(cm²)	(unitless)	(unitless)	(μg/m³)	(μ g/m³) ⁻¹	(mg/m³)
259	15	2.04E+02	0.10	9.95E+01	1.28E-02	4.00E+02	4.15E+84	9.45E-04	1.92E-01	1.1E-04	4.0E-02

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

expo groun cor carci	oor osure dwater nc., nogen g/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
103	E-01	3.04F+02	1.93E-01	1.47E+06	1.93E-01	NA NA	l NA
1.50	L-V1	U.U72 TUZ	1.502-01	1.476700	<u>(.80⊏-01</u>	L NA	L INA

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

APPENDIX C SENSITIVITY ANALYSIS DATA

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (µg/L)	risk from vapor intrusion to indoor air, carcinogen (unitless)	quotient quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.73E+00	2,72E+03	1.73E+00	1.47E+06	1.73E+00	NA.	NA J

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.73E+00	2.72E+03	1.73E+00	1.47E+06	1.73E+00	NA NA	NA NA

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
6.26E-01	9.84E+02	6.26E-01	1.47E+06	6.26E-01	NA NA	NA I

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

Table 4

CANCER RISK AND HAZARD QUOTIENT EVALUATION:

SUBSURFACE VAPOR INTRUSION INTO BUILDINGS FROM ON-SITE GROUNDWATER (MW-4) - Loamy Sand

Commercial/Industrial Receptor

Techalloy, Union, Illinois

Chemical	Maximum Concentration	Units	Risl	REEN (1) c-based ation (ug/L)	Cancer Risk (unitless)	Hazard Quotien (unitless)
	(MW-4)		Cancer	Noncancer		<u> </u>
VOCs						_
1,1-Dichloroethene	ND	ug/L		4.43E+02		T -
1,1-Dichloroethane	21	ug/L		6.61E+03		3.2E-03
1,1,1-Trichloroethane	59	ug/L		9.52E+03		6.2E-03
Trichloroethene	5.4	ug/L	6.26E-01	9.84E+02	8.6E-06	5.5E-03
Tetrachloroethene	55	ug/L	1.51E+01		3.6E-06	
cis-1,2-Dichloroethene	ND	ug/L		6.56E+02		
					1E-05	
(1) Risk-based soil concentration based	on Johnson and Ettinger	Model (U.	S. EPA, 2003).			1E-02

Ca - carcinogenic endpoint.

NC - noncarcinogenic endpoint.

Table 5

CANCER RISK AND HAZARD QUOTIENT EVALUATION:
SUBSURFACE VAPOR INTRUSION INTO BUILDINGS FROM ON-SITE GROUNDWATER (MW-100) - Sandy Loam
Commercial/Industrial Receptor
Techalloy, Union, Illinois

Chemical	Maximum	Units		REEN (1) c-based	Cancer Risk	Hazard Quotien
	Concentration		Concentr	ation (ug/L)	(unitless)	(unitless)
	(MW-100)		Cancer	Noncancer	1	
VOCs						
1,1-Dichloroethene	ND	ug/L		4.43E+02		
1,1-Dichloroethane	ND	ug/L		6.61E+03		
1,1,1-Trichloroethane	6	ug/L	-	9.52E+03		5.8E-04
Trichloroethene	ND	ug/L	1.73E+00	2.72E+03		
Tetrachloroethene	16	ug/L	4.24E+01	T	3.7E-07	
cis-1,2-Dichloroethene	ND	ug/L		6.56E+02		
					4E-07	
(1) Risk-based soil concentration based	on Johnson and Ettinger	Model (U.	S. EPA, 2003).			6E-04

Ca - carcinogenic endpoint.

NC - noncarcinogenic endpoint.

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Hazard quotient from vapor intrusion to indoor air,

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.24E+01	NA NA	4.24E+01	2.00E+05	4.24E+01	NA NA	NA I

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5 77 WEST JACKSON BOULEVARD CHICAGO, IL 60604-3590

15 April 1999

VIA FACSIMILE AND FIRST CLASS MAIL REPLY TO THE ATTENTION OF:

DE-9J

Mr. Carlos J. Serna Senior Project Manager Roy F. Weston, Inc. Suite 400 3 Hawthorn Parkway Vernon Hills, IL 60061-1450 (Fax No. 847-918-4055)

RE: Techalloy Co., Inc.

Union, IL Facility ILD 005 178 975

Corrective Measures Implementation Cost Estimate

Dear Mr. Serna:

As you are well aware, Techalloy Co., Inc. ("Techalloy") and the United States Environmental Protection Agency ("EPA") are nearing the conclusion of negotiations for a Corrective Measures Implementation ("CMI") Administrative Order on Consent ("Consent Order"). One outstanding issue has to do with Techalloy's requirement to establish financial assurance for implementation of the selected remedial alternative, pursuant to Section XXII, "Financial Responsibility," of the Consent Order. You and I have exchanged electronic mail and have discussed the matter of financial assurance and remediation costs on at least two occasions by telephone in February of this year. Attorneys for Techalloy and EPA have also discussed the matter of financial assurance. Techalloy has asked that the number be further reduced from the figures you and I discussed earlier this year. It appears that there is now some uncertainty as to what number is to be incorporated into the CMI Consent Order. Hence, the purpose of this letter.

I have reviewed the cost estimates contained in the *Corrective Measures Study Report* (August 1997, Roy F. Weston, Inc.), ("CMS Report"), and in the EPA's Statement of Basis. The costs considered reflect components from CMS Report alternatives S-2 (soil remediation) and GW-2A (groundwater remediation). On 9

February 1999, you sent a message to me via electronic mail. In that message you indicated, "[t]he total cost for the remediation described in the [S]tatement of [B]asis will cost Techalloy \$3,060,800." This included \$1,085,800 for the soil remediation component and \$1,975,600 for the groundwater component. The cost for the groundwater pump and treat system has been deducted because construction of this component has already been completed under an interim remedial measure. In summary, we had a general understanding that the remediation costs, including present worth calculations for yearly groundwater monitoring and operations and maintenance ("O&M"), were approximately \$3.1 million. These costs included a contingency factor of +25%. In fact, all the cost estimates provided by Techalloy (and Weston) in the CMS Report included this same contingency factor. This is an important point to note, especially in light of the fact that Techalloy is now requesting that the financial assurance requirement be reduced specifically by way of reducing the contingency factor² consistently applied in the remedial alternatives cost work-ups in the CMS Report.

I do believe there may be an error in the cost estimate. As I calculate the annual costs for groundwater pump and treat and for air sparging ("AS") and soil vapor extraction ("SVE"), I arrive at a total cost of \$1,932,000³, versus the

¹The costs you provided included a +25% contingency, as well as present worth calculations for annual operations and maintenance costs. The O&M costs accounted for an assumed interest factor of 7% annually, and were determined for a 10-year life for the soil vapor extraction (SVE) component and a 30-year life for the groundwater pump and treat system. Alternative S-2 was determined to be \$1,140,000.00, less the capital cost of a treatment building (set at \$54,200.00), which yields \$1,085,800.00. The groundwater alternative, GW-2A, slightly overestimates – according to your 9 February 1999 e-mail – the SVE system, but you suggested keeping the figures as presented in the CMS Report (*i.e.*, \$3,009,600.00), less the cost of groundwater treatment (*i.e.*, presented in alternative GW-2 as a single lump sum of \$1,034,600.00), which amounts to \$1,975,600.00. The total, with the deductions noted, equals \$3,060,800.00.

²Attorneys for Techalloy have suggested reducing the contingency factor from +25% to either +10% or +15%. This would amount to a 40% - 60% decrease in monies considered for unforeseen cost overruns.

 $^{^3}$ AS/SVE annual O&M costs of \$60,600.00 per year @ 10 years = \$606,000.00. Interim measures pump and treat annual O&M costs of \$37,400.00 @ 30 years = \$1,122,000.00. Groundwater monitoring costs of \$6,800.00 per year @ 30 years = \$204,000.00. These three components total \$1,932,000.00 vs. the \$2,932,000.00 indicated in the GW-2A cost estimate. Adding a +25% contingency to these annual O&M costs results in \$2,415,000.00, not the

\$2,932,000 shown in the alternative GW-2A cost estimate.⁴ The total present worth for the 30-year O&M costs is calculated to be \$1,217,000.00. This number may be correct, as the three individual components appear reasonable, but should be revisited.

There are several other concerns which should be addressed. For ease of reference, they are enumerated below:

- (1) The CMS Report cost estimates are now nearly two years old. We suggest that Techalloy provide EPA with a revised cost estimate. Minor increases in the construction cost index ("CCI")⁵ could affect the 1997 construction cost estimates. Granted, this will not result in significant changes to the capital cost estimates. However, it does reflect some increases over time in construction costs that should be taken into consideration.
- (2) GW-2A includes costs for two vapor phase carbon units and two blowers. In the revised cost estimate "Comments" column, please provide the size of the blowers, based on estimated air flow requirements through the AS/SVE system. Also, in the same column, provide a description of the carbon units. Will both be in service simultaneously, or is one a back-up? Did Weston consult available adsorption isotherms and soil-water partitioning coefficients for the constituents of concern in sizing the carbon beds and in determining breakthrough? Based on the concentrations of volatile organics in the groundwater and flowrates through the carbon units, has any estimate been made for carbon replacement or regeneration costs? Perhaps some of these questions will be answered during the pilot study. If so, please indicate that, and we can discuss at a later date.

^{\$3,665,000.00} indicated in the CMS Report as "SUB-TOTAL: (O&M Costs) with 25% contingency."

⁴The \$1,000,000.00 difference could be the result of a simple error in addition.

⁵The construction cost index ("CCI") for August 1997 (when the CMS Report cost estimates were performed) was 545.0. In January 1999, the CCI was 558.5. <u>See Chemical and Engineering News</u> (February 1999). This reflects an increase of roughly 2.5%.

- (3) The estimates for the AS/SVE trench, blower piping and compressor piping may be low. They are given at 1500 linear feet. Quick measurements taken off of Figure 3-5 of the CMS Report indicate that the estimates are low, and more on the order of 2500+ linear feet.
- (4) Alternative S-2 includes stabilization costs of \$30.00 per cubic yard of impacted soil. We ask that you revisit this value to include increases, if any, in treatment costs by vendors since mid-1997.
- (5) Cost work-up GW-2A, under "AS/SVE ANNUAL OPERATIONS AND MAINTENANCE COSTS" states in the column labeled "Comments" that it is assumed "carbon would only be needed initially." Are you anticipating a short-term use for the carbon beds, and that the solvent-laden air stream from the SVE system could be discharged directly to the environment?
- (6) EPA is concerned that the administrative record ("AR") is maintained in such a way as to allow for the general public to gather information on this site with as little difficulty as possible. With information repositories containing considerable amounts of technical information, this is quite challenging. We believe it would be in the best interest of the public record if another cost estimate was performed and submitted to this Agency. The selected alternative includes components from two alternatives in the CMS Report, and even then, some individual components e.g., the cost of the treatment building in alternative S-2 are deleted from the overall cost estimate, for reasons which you and I have shared in our electronic correspondence, but which would not be readily discernable by those who might be inclined to review the AR.
- (7) A new cost work-up would allow for revisions to the contingency factor, as requested by Techalloy. If Weston were to revisit the CMS Report cost estimates and take into consideration any recent construction, labor and/or vendor increases, EPA would be willing to allow a +10% contingency factor for all capital cost figures. Given the uncertainty of projecting costs over a 10-year and, more significantly, over a 30-year project life, we believe a +15% contingency factor for annual O&M and groundwater monitoring cost estimates is reasonable.

We believe a recalculation of remediation costs, given all the considerations above, is appropriate at this time. Consideration of minor cost increases over the

past two years, coupled with a reduction in contingencies from a universal +25% to +10% for capital expenditures and +15% for long-term O&M and monitoring costs, should result in a Quire lower than the roughly \$3.1 million figure we have discussed in the past.

In the interest of expediting final resolution of this matter and filing of the Consent Order, we request that you provide EPA with a revised cost estimate for the selected remedy by 3 May 1999.

If you have any questions concerning this letter, please feel free to contact me directly at (312) 886-4582. My e-mail address is: <u>valentino.michael@epa.gov</u>.

Sincerely yours,

Michael Valentino

Corrective Action Project Manager

cc: Margaret Rosegay, Esq., of Pillsbury, Madison and Sutro Jacqueline Kline, Asst. Regional Counsel, EPA-Region 5, ORC







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C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES (code "T04"). FOR EACH PROCESS ENTERED HEPE INCLUDE DESIGN CAPACITY.

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III. PROCESSES (continued)

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included with above

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V. FACILITY DRAWING	_							
All existing facilities must include in the space provided on p	age 5 a scale drawin	g of the facility <i>(see instruc</i>	tions for more a	e tail).	1000年3月	ex. P	4	N. Caller
VI. PHOTOGRAPHS								
All existing facilities must include photographs (aeria treatment and disposal areas; and sites of future store						ting st	orage,	n i di tanan
VII. FACILITY GEOGRAPHIC LOCATION	5-7							
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VIII. FACILITY OWNER			72 - 74 75	76	77 - 79	1	- 4.18 L.B.	4-44
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IX. OWNER CERTIFICATION	45 15 16		40 4					·
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EPA Form 3510-3 (6-80)	1/U CACE	4 OF 5			100	CONT	INUE	ON PAG

PAGE 4 OF 5

'. FACILITY DRAWING (see page 4) RECEIVED)EU 1 ± 1985 IPPNOLPC

ATTACHMENT 2

Certification Regarding Potential Releases from Solid Waste Management Units

ATTACH MENT 2 Reply To E.P.A.

LAW OFFICES

DRINKER BIDDLE & REATH

PHILADELPHIA NATIONAL BANK SUILDING

BROAD AND CHESTNUT STREETS

PHILADELPHIA, PA. 19107

TELEX: 634664 . DEBEMAC

12181 #88-2700

405 PARE AVENUE HEW YORK, N 7 10022 (212) 036-8406

DIRECT DIAL (215) 000- 2614

March 13, 1986

Mr. George Miller
Maintenance Superintendent
Techalloy Illinois, Inc.
P.O. Box 423
Union, IL 60181

Mr. William Pigott
Techalloy Illinois, Inc.
P.O. Box 423
Union, IL 60181

Re: Response to EPA Request for Information

Dear Bill and George:

Enclosed for your review is a draft response to the EPA request for information. Please feel free to call if you have any questions.

Very truly yours,

Virginia (sipson-Mason

VGM:ctf Encl.

--

1788 H STREET, N.M.

WASHINGTON, O.C. 2003G

12020 420-7400

cc: Mr. Henry Lopes (w/encl.)
 James Eiseman, Jr., Esq. (w/encl.)

CERTIFICATION REGARDING POTENTIAL RELEASES FROM SOLID WASTE MANAGEMENT UNITS

FACIL	ITY NAME:	Techalloy Illin	ois, Inc.	·	
EPA 1.D	. NUMBER:	ILD005178975			
LOCATIO	N CITY:	Olsen and Jeffe	rson Roads, U	nion	
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***************************************	(See a	attached sheet.)			

NOTE: Hazardous wastes are those identified in 40 CFR 261. Hazardous constituents are those listed in Appendix VIII of 40 CFR Part 261.

3. For the units noted in Number 1 above and also those hazardous waste units in your Part A application, please describe for each unit any data available on any prior or current releases of hazardous wastes or constituents to the environment that may have occurred in the past or may still be occurring.

Please provide the following information

- a. Date of release
- b. Type of waste released
- c. Quantity or volume of waste released
- d. Describe nature of release (i.e., spill, overflow, ruptured pipe or tank, etc.)

(See	attached sheet.)
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4. In regard to the prior or continuing releases described in Number 3 above, please provide (for each unit) any analytical data that may be available which would describe the nature and extent of environmental contamination that exists as a result of such releases. Please focus on concentrations of hazardous wastes or constituents present in contaminated soil or groundwater.

No such data	is available.	

I certify under penalty of law that this document and all attachments were prepared under my direction or-supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the submittal is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. (42 U.S.C. 6902 et seq. and 40 CFR 270.11(d))

George Miller, Maintenance Superintendent

Typed Name and little

March 18, 1986

04:0

Attachment to Certification Regarding Potential Releases from Solid Waste Management Units

2. Container Storage Area - In the area marked "A" on the site plan, which currently is used for drum storage of non-hazardous materials, drums of spent solvent were stored until approximately 1980.

Waste Treatment, Detoxification - For a period beginning in the early 1960's, Techalloy treated its acid wash water (spent pickle liquor) by neutralizing it with ammonia, then filtering it through a limestone-filled, in-ground holding bed lined with steel behind its acid house. The bed is marked with an "A" on the enclosed site plan. The filtered, neutralized acid then traveled through a ceramic drainage tile to a dry-bed "pond" where the liquid evaporated. The pond is approximately 20 feet wide and 150 feet long and is located at site "B" on the plan. The pickling solution consisted of dilute hydrofloric, sulfuric, muriatic and nitric acids. In 1969 or 1970, the drainage tile was closed off, but the limestone bed was still utilized in tandem with a clarifying tanker until approximately 1980.

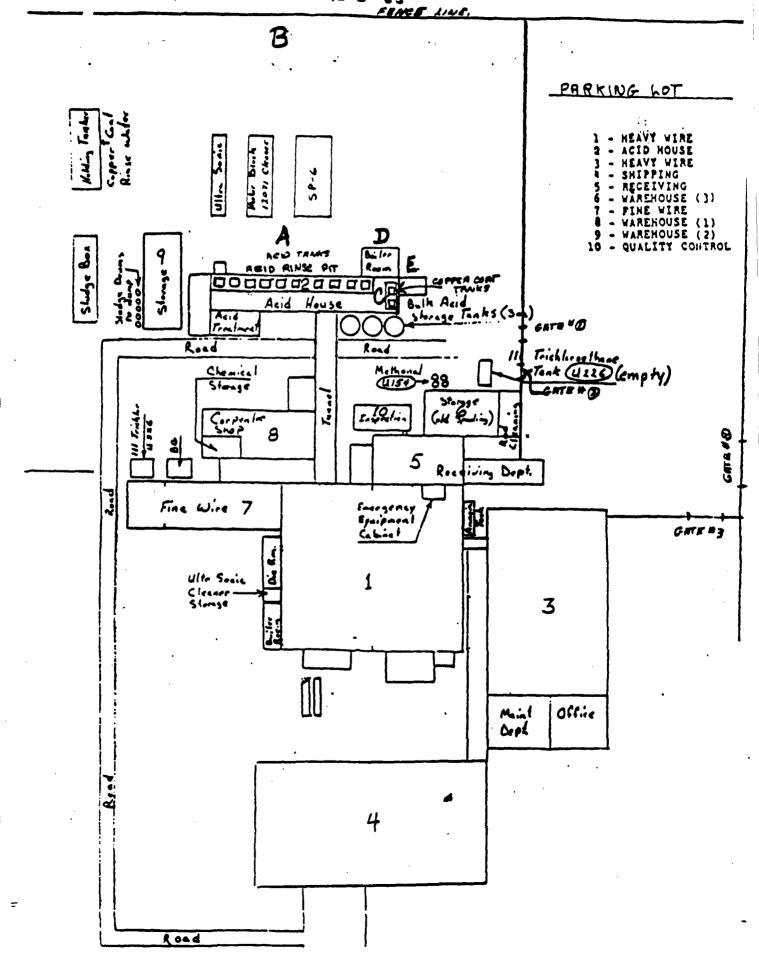
Since 1968 or 1969, Techalloy has intermittently operated a copper coating process in which wire is washed first in a nickle plating bath of dilute nickle sulfate, then rinsed over a well with large quantities of water. The wire is then lowered into a dilute cyanide bath, then rinsed over the well with large quantities of water. These two baths sit in tanks in a well at site C on the plan. From that time until 1978, overflow from the well was occasionally drained by a sump pump, through a pipe and discharged onto the ground at location D on the plan. This method of removing overflow was changed in 1979 and the sump pump was removed.

Techalloy occasionally utilized 1,1,1-trichlorethane in its process for several years. For an unknown period of time, until 1978, Techalloy treated some of its spent solvent by evaporation outdoors on a cement pad, marked E on the site plan. Although Techalloy has no direct knowledge of this, it is possible that some of the TCE placed upon the pad for evaporation spilled onto the ground adjacent to the pad. The quantities of TCE evaporated in this way were small, and cannot be determined with any more precision from records in existence at the present time.

3. (a) In June, 1985, it was discovered that the well containing the pickling tanks had a leak through two cracks in the 10-inch thick wall of the well.

- (b) The material was extremely dilute acid wash water (spent pickle liquor) and treated, neutralized pickle liquor.
- (c) The quantity of the leak was not measured, but is believed to be small given the size of the cracks discovered.
- (d) By digging the dirt away from the outside wall, Techalloy discovered one pinhole-type crack and another larger crack about 36 inches long. These were repaired with cement and epoxy.

Up-dated Storage Plan 12-3-85



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ittachment 1

CERTIFICATION REGARDING POTENTIAL RELEASES FROM SOLID HASTE MANAGEMENT UNITS

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MAR 18 1991

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*See Attachment B for original submittal.

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IEPA-DLPC

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b	Sate of release Type of waste released Quantity or volume of waste released Describe nature of release (1.e., spill, overflow, ruptured pipe or tank, etc.)	
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JH:mab/5143/sp/4-5

ATTACHMENT A

ADDENDUM TO CERTIFICATION REGARDING POTENTIAL RELEASES FROM SOLID WASTE MUNICIPAL SITES

2. Under Item 1, underground storage tanks and container storage areas were checked as present at the facility:

 Pickling rinse waters 	
---	--

KO62 waste, acidic and caustic, presently stored in two tanks, 10,500 gallons and 16,500 gallons. No information on quantities or volume of waste which leaked from a crack in the sidewall. This leak was patched in July, 1985. Identified as M on the attached plot plan.

Plating filters

Hazardous stored in drums. Drums arestored at Q on the attached plot plan. No spills have occured.

ADS Sludge

Identified as P on the attached plot plan. Hazardous, stored in drums. No spills have occured.

Metal hydroxide Sludge

Hazardous, stored in hopper at R. No waste has been treated since 1988, therefore no sludge has been generated since 1988.

SP-6 Sludge

Special waste, non-hazardous. Stored at P with sludge drums. No spills recorded.

Waste oils

Special, stored in drums at P. No spills recorded.

• MbS₂ process filters

Special, no apparent hazardous constituents as identified in Appendix A of 40 CFR 261. Stored at N. Only one drum was generated prior to the 1990 IEPA inspection. No current generation,

no spills recorded.

- 3. As indicated on the Certification Form and as requested in Item 11 of the Closure Plan, it appears that, at some time in the past, trichloroethane, which was used as a degreasing fluid at the facility, leaked or spilled at the facility. It appears that this may have occurred at either point E or at point S, or both, as shown on the attached plot plan. The area at E was used for hand degreasing, heavy stainless rods, using rags. The data available is the current data collected in the groundwater investigation at the facility beginning in approximately December 1989 and continuing through the present time. WESTON and Techalloy have this data. No trichloroethane is currently used on the property. The plume has been described. Quantity of waste released is not known.
- 4. See No. 3 above regarding available data. The ranges of contamination in the soil are from non-detectable to 1 million parts per billion. The concentrations of trichloroethane in the groundwater range from non-detectable to 15,000 ppb.

CERTIFICATION REGARDING POTENTIAL RELEASES FROM SOLID WASTE MANAGEMENT UNITS

	÷ .				
FACIL	ITY NAME:	Techalloy Illinoi	s, Inc.		
EPA 1.D	. NUMBER:	ILD005178975			
LOCATIO	N CITY:	Olsen and Jeffers	on Roads, U	nion	
	STATE:				
close	ed) at your	of the following solic facility? NOTE - DO IN YOUR PART A APPL	NOT INCLUDE		
• Si	torage Tank ontainer St njection We astewater T ransfer Sta aste Recycl	(Above Ground) (Underground) orage Area lls reatment Units	YESX	NO X X X X X X X X X	
prov of 1: would RCRA disp of e	ide a descr n each unit d be consid . Also inc osed of and ach unit an ide a site	es" answers to any oription of the wastes. In particular, placed as hazardous was lude any available di the dates of disposed include capacity, plan if available.	that were ease focus stes or haz data on quantal. Please	stored, treate on whether or ardous consti- tities or vol- also provide	ed or disposed not the wastes tuents under ume of wastes a description
	1000	occorred original ori		RECE	IVED
				MAR 1	8 1991
The Contraction of the Contracti				1EPA	DLPC
~					

NOTE: Hazardous wastes are those identified in 40 CFR 261. Hazardous constituents are those listed in Appendix VIII of 40 CFR Part 261.

3. For the units noted in Number 1 above and also those hazardous waste units in your Part A application, please describe for each unit any data available on any prior or current releases of hazardous wastes or constituents to the environment that may have occurred in the past or may still be occurring.

Please provide the following information

A .	Date	of	cel	
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- b. Type of waste released
- c. Quantity or volume of waste released
- d. Describe nature of release (i.e., spill, overflow, ruptured pipe or tank, etc.)

(See	attached sheet.)
	•

4. In regard to the prior or continuing releases described in Number 3 above, please provide (for each unit) any analytical data that may be available which would describe the nature and extent of environmental contamination that exists as a result of such releases. Please focus on concentrations of hazardous wastes or constituents present in contaminated soil or groundwater.

 No :	such	data	is	available.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the submittal is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. (42 U.S.C. 6902 et seq. and 40 CFR 270.11(d))

George Miller, Maintenance Superintendent
Typed Name and Title

March 18. 1986
Date

Attachment to Certification Regarding Potential Releases from Solid Waste Management Units

2. Container Storage Area - In the area marked "A" on the site plan, which currently is used for drum storage of non-hazardous materials, drums of spent solvent were stored until approximately 1980.

Waste Treatment, Detoxification - For a period beginning in the early 1960's, Techalloy treated its acid wash water (spent pickle liquor) by neutralizing it with ammonia, then filtering it through a limestone-filled, in-ground holding bed lined with steel behind its acid house. The bed is marked with an "A" on the enclosed site plan. The filtered, neutralized acid then traveled through a ceramic drainage tile to a dry-bed "pond" where the liquid evaporated. The pond is approximately 20 feet wide and 150 feet long and is located at site "B" on the plan. The pickling solution consisted of dilute hydrofloric, sulfuric, muriatic and nitric acids. In 1969 or 1970, the drainage tile was closed off, but the limestone bed was still utilized in tandem with a clarifying tanker until approximately 1980.

Since 1968 or 1969, Techalloy has intermittently operated a copper coating process in which wire is washed first in a nickle plating bath of dilute nickle sulfate, then rinsed over a well with large quantities of water. The wire is then lowered into a dilute cyanide bath, then rinsed over the well with large quantities of water. These two baths sit in tanks in a well at site C on the plan. From that time until 1978, overflow from the well was occasionally drained by a sump pump, through a pipe and discharged onto the ground at location D on the plan. This method of removing overflow was changed in 1979 and the sump pump was removed.

Techalloy occasionally utilized 1,1,1-trichlorethane in its process for several years. For an unknown period of time, until 1978, Techalloy treated some of its spent solvent by evaporation outdoors on a cement pad, marked E on the site plan. Although Techalloy has no direct knowledge of this, it is possible that some of the TCE placed upon the pad for evaporation spilled onto the ground adjacent to the pad. The quantities of TCE evaporated in this way were small, and cannot be determined with any more precision from records in existence at the present time.

^{3. (}a) In June, 1985, it was discovered that the well containing the pickling tanks had a leak through two cracks in the 10-inch thick wall of the well.

- (b) The material was extremely dilute acid wash water (spent pickle liquor) and treated, neutralized pickle liquor.
- (c) The quantity of the leak was not measured, but is believed to be small given the size of the cracks discovered.
- (d) By digging the dirt away from the outside wall, Techalloy discovered one pinhole-type crack and another larger crack about 36 inches long. These were repaired with cement and epoxy.

Attachment 3
Techalloy Groundwater Data Summary

Compound	MW-1	MW-2	MM-3	MW-4	MW- 5	MW- 5D
Methylene Chloride	ND	ND	ND	ND	5	4
1,1-Dichloroethene	ND	100	ND	190	210	5
1,1-Dichloroethane	ND	86	ND	200	95	6
1,2-Dichloroethene (total)	ND	30	ND	97	8	2
1,2-Dichloroethane	ND	3000	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	100	ND	6000	5600	310
Trichloroethene	ND	11	ND	270	110	300
1,1,2-Trichloroethane	ND	ND	ND	18	9	ND
Tetrachloroethene	ND	76	ND	1000	620	ND
Acetone	ND	26	ND	ND	29	13
Chloroform	ND	ND	ND	ND	ND	ND
Benzene	·ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	16	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND
Compound	MW-6	MW-7	MW-8	MW-9	HBR	6211
Methylene Chloride	5	ND	ND	8	10	ND
1,1-Dichloroethene	ND	ND	ND	ND	120	ND
1,1-Dichloroethane	ND	ND	ND	ND	5	ND
1,2-Dichloroethene (total)	ND	ND	ND	ND	8	ND
1,2-Dichloroethane	ND	ND	ND	ND	8	ND
1,1,1-Trichloroethane	39	ND	ND	18	3700	ND
Trichloroethene	ND	ND	ND	ND	24	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND
Tetrachloroethene	52	ND	ND	3	320	ND
Acetone	ND	ND	ND	25	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	36	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND

All values in ppb ND - Not detected.

Attachment 3 (continued)
Techalloy Groundwater Data Summary

Compound	6212	6304	6105	6201	6402	17422
Methylene Chloride	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	2	ND
1,2-Dichloroethene (total)	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	4	ND	ND	ND	9
Trichloroethene	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	2	ND	ND	ND	ND
Acetone	ND	ND	ND	ND	ND	ND
Chloroform	ND	4	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	2	ND	ND	ND	ND

All values in ppb. ND - Not detected.

Southern California Chemical

CHEMICAL QUALITY OF GROUND WATER IN MONITORING WELLS AND UNION WELL #3 - INORGANIC PARAMETERS

PARAMETER		WELL IDENTIFICATION (Screened interval, ft)						
	UNITS	W-1 (57-67)	W-1A (8-18)	W-2 (28-38)	W-2B (DUPLI- CATE) (28-38)	W-3 (63-73)	₩-4 (6-11)	UNION WELL #3 (60-80)
Alkalinity, Total (CaCO3)	mg/L	348	212	644	628	376	356	380
Chloride Chloride	mg/L	94	8	1410	1320	158	39	570
Hardness, Total (CaCO3)	mg/L	312	264	<1	<1	472	344	952
Nitrogen, Ammonia	mg/L	13	2.7	370	360	1.7	0.19	36
Nitrogen, Nitrate	mg/L	0.73	9.0	0.24	0.16	1.01	0.12	0.04
рН	units	7.02	7.30	6.66	6.66	7.20	8.40	7.08
Sulfate	mg/L	87	67	4000	3400	320	72	700
Arsenic	mg/L	<0.001	0.001	0.002	0.002	<0.001	0.002	0.001
Barium	mg/L	1.39	0.200	0.088	0.106	0.802	0.169	0.124
Cadmium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Calcium	mg/L	62.2	371	635	637	93.8	358	250
Chromium, Total	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	mg/L	0.03	0.04	0.02	0.11	0.03	<0.01	<0.01
Iron ·	mg/L	1.17	3.20	6.72	30.1	2.21	2.04	7.05
Lead	mg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Magnesium	mg/L	44.5	100	338	333	56.4	116	102
Manganese	mg/L	0.07	3.80	3.59	3.21	0.12	0.85	0.18
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	<0.01	0.04	0.07	0.07	<0.01	<0.01	0.02
Potassium	mg/L	7.60	4.63	23.5	23.7	6.15	1.36	25.9
Selenium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sodium	mg/L	79.6	8.43	356	335	50.7	29.2	266
Zinc	mg/L	0.789	0.422	0.230	0.275	0.506	0.037	0.007

Notes:

Union Well #3 sampled on March 21, 1990 Monitor wells sampled on April 3, 1990

[1c/q-t(\$0)sccc-5-A.tb1]

Southern California Chemical CHEMICAL QUALITY OF GROUND WATER IN MONITORING WELLS AND UNION WELL #3 - VOLATILE ORGANIC COMPOUNDS

PARAMETER			WELL IDENTIFICATION (Screened interval, ft)						
	UNITS	W-1 (57-67)	W-1A (8-18)	W-2 (28-38)	W-2B (DUPLI- CATE) (28-38)	W-3 (63-73)	W-4 (6-11)	UNION WELL #3 (60-80)	
Benzene	μg/L			1.8				i	
1,1-dichloroethane	μg/L			7.3	9.8				
1,2-dichloroethane	μg/L				2.6				
1,1-dichloroethene	μg/L		2.0		1.3				
Cis-1,2-dichloroethene	μg/L	 		4.5	5.7				
1,2-dichloropropane	μg/L			19.0	29.7				
Toluene	μg/L			2.3					
Trichloroethene	μg/L	2.6		1.5	2.1				
Tetrachloroethene	μg/L		1.4						
1,1,1-trichloroethane	μg/L		1.6						

Notes:

Union Well #3 sampled on March 21, 1990 Monitor wells sampled on April 3, 1990 Blank indicates below detection limit

[lc/q-t(90)sccc-5-B.tbl]

